AN INVESTIGATION OF A SERIES OF TWO HUNDRED CASES OF NEPHRITIS.

by

R. N. GIBSON, M.B., Ch.B.

Thesis for the Degree of M.D. July 1925

C O N T E N T S.

I. INTRODUCTION.

Within recent years many workers have drawn attention to the fact that much useful information can be obtained about the existing state of certain abdominal organs by means of accurately conducted and cautiously interpreted "Function Tests". Whilst much ingenuity has been shown in devising these tests, there is little doubt that the claims made by a number of investigators have not yet been clearly established. Those tests which deal with the existing state of the liver, the pancreas and the kidneys are perhaps the best recognised. The present research is concerned with the last named.

Not so many years ago all persons who showed the presence of albumin in their urine were regarded with suspicion. Their medical advisors were unable to give a satisfactory prognosis, insurance companies refused them, and in many instances they were not considered suitable to hold positions for which they had applied. Those days have to some extent passed and albuminuria is no longer regarded as a definite indication of renal disease, though it is not yet fully realized that whilst albuminuria is a common finding nephritis is on the other hand a comparatively rare disease.

There is now substantial evidence (Maclean[1]), chiefly based upon observations carried out upon soldiers/

soldiers during the war, that approximately five per cent of healthy individuals show some degree of albuminuria, and that the albuminuria in these cases was not due to the strain of training was shown by its incidence in newly joined recruits. Maclean[2] also noted that when these men went into the fighting area and were subjected to all the hardships therein, they did not appear to be predisposed to nephritis or any other illness.

The different conditions associated with albuminuria may be classified into the following groups:-

1. Certain forms of Nephritis.
2. Physiological or temporary albuminuria.
3. Adolescent or functional albuminuria.
4. Symptomatic albuminuria.

(a) Conditions such as fevers in which the diagnosis is readily made by ordinary examination.

(b) Conditions such as tuberculosis of the kidney in which the cause may be obscure and diagnosis therefore difficult.

1. Nephritis.

That albuminuria occurs in varying amounts in cases of nephritis is well known and the examination of a nephritic patient will be referred to later.

2. Temporary Albuminuria.

This type is also well known as physiological albuminuria and results from various factors such as sustained/

sustained exertion as shown by Borach in his experiments upon Marathon athletes, in the majority of these he found albuminuria after they had completed a twenty-four mile course. Other observers (Chandler[3]) have found a similar condition in the crews after the Inter-University boat race. Again it has been observed (Maclean[4]) in soldiers after a hard course of training. This albuminuria however soon disappears on resting and does not tend to become permanent even after many months of severe muscular exertion.

3. Adolescent Albuminuria.

This type is one known by many names, the best known of which are as follows:- functional, postural, orthostatic, cyclic and lordotic. This is an interesting condition from which no ill-effects occur and which is in no way related to nephritis. In the majority of cases it appears to clear up in after years and so far as is known it has no deleterious effects on the kidney or upon the patient in general. It is often absent when the patient is recumbent, only to reappear when the erect posture is assumed.

There are many theories as to the causation of this condition; the three best known of which are given here:-

1./

1. Pavy, Jehle and others have advanced the theory that it depends upon a mechanical interference with the renal circulation.
2. Jessier's theory is that it is due to a developmental defect of the glomeruli resulting in their increased permeability.
3. Erlander and Hooker regard the condition as being due to vaso-motor instability.

Whatever the cause of this condition it is one which is of no pathological significance and one which the physician must recognise and be able to give its true value.

4. Symptomatic Albuminuria.

(a) Conditions such as fevers in which the diagnosis is readily made by ordinary examination.

Under this heading fall the albuminurias of the feverish states, of amyloid disease (Price[5]) following some chronic suppurative condition or some old standing syphilitic lesion, and of the inflammatory conditions of the urinary tract such as cystitis, pyelitis and gonorrhoea. Only one of these diseases might give rise to difficulty in diagnosis and that is when does the albuminuria associated with fever indicate nephritis and when merely cloudy swelling of the kidney? However, where there is haematuria and perhaps /

perhaps scanty urine with an increase of albumin it may be assumed that the condition is one of nephritis and this can be confirmed by the discovery of blood, granular and epithelial casts.

(b) Conditions such as tuberculosis of the kidney in which the cause may be obscure and diagnosis therefore difficult.

In addition to the condition of renal tuberculosis into this group also come the rare conditions of malignant tumours of the kidney, polycystic disease and bacillus coli infection of the urinary tract.

It has been held therefore that a harmless albuminuria exists and it is as an aid to distinguish this from serious forms that the Newer Renal Efficiency Tests have been evolved. These tests can easily be divided into three groups:-

1. Those in which the partition of various substances between blood and urine is examined; of this group the Blood Urea Test is a prominent example.

2. Those depending on the administration of some foreign substance, such as a dye, with the subsequent observation as to how rapidly and completely the kidney excretes it; the Phenol-sulphonephthalein Test is typical of this group.

3. Those which depend upon the determination of the excretion of some substance which is natural to the individual; probably the Urea Concentration Test of Maclean and De Wesselow is the best known test belonging to this group.

The objects of the tests may be described as follows:-

1. To discover whether there is any renal disturbance at all. Thus it is a valuable aid in differentiating between nephritic and non-nephritic albuminurias.

2. To determine the extent of renal damage.

Wherein it is a powerful aid in diagnosis and prognosis.

(a) Diagnosis. As already mentioned it is a guide as to whether the albuminuria is due to nephritis or is of no significance. Not only so but it is of use in differentiating between the various forms of nephritis which may be classified into three types:-

I. Anhydraemic. Where the main abnormality is found in the blood which contains an increased amount of urea nitrogen.

II. Hydraemic. Where there is little or no retention of urea, but marked deficiencies in the urine.

III. Mixed which has some of the characteristics of both types.

(b) Prognosis. When efficiency tests are carried out together with a careful examination of the general condition of the patient and cardio-vascular system a more certain prognosis can be given, also by repeated examinations and tests the progress of the case can be gauged.

3. As a guide to the advisability of undertaking operative treatment.

When operative treatment becomes necessary the results are largely dependent upon the state of the kidneys. In those conditions where the kidney shows impaired function a major operation should be postponed and nothing more than the treatment absolutely necessary should be carried out. As an instance of this the operation of prostatectomy may be quoted. In many of these conditions the free passage of urine has been hindered for a long time with the result that the kidney has suffered from the results of backward pressure and its efficiency becomes seriously impaired. Under such circumstances it would be advisable to perform the operation in two stages, that is a suprapubic cystostomy first, followed by a prostatectomy at a later date when the kidneys had recovered some of their efficiency.

In chronic nephritis the renal efficiency is never recovered/

recovered to any large extent but in conditions resulting from backward pressure the efficiency often improves upon removal of the cause. A major operation carried out in the first instance might easily lead to further inefficiency with a danger of resultant uraemia.

4. To assess the danger to life from some other disease the recovery from which depends upon a sound kidney.

It will be understood that renal deficiency is not conducive to recovery in any disease, but there are two conditions in which this is especially true:- namely, in pneumonia and in cardiac affections. Very few cases of pneumonia survive when there is marked renal deficiency. Most cases of renal deficiency show a raised blood pressure and this is a serious condition in cardiac disease. Thus the prognosis in acute cardiac conditions associated with this complication is grave.

---

2. RENAL EFFICIENCY TESTS COMPARED.

During the past three years at Craigleith Hospital, Edinburgh, I have made careful observations upon two hundred patients, admitted with a diagnosis of nephritis, carrying out in each instance urea concentration tests together with a full clinical examination.

The renal efficiency tests considered were:-

I. The Blood Urea Concentration Test.

This test was carried out by the method originally suggested by Van Slyke[6], but modified by Maclean and De Wesselow[7].

The principle of the test depends upon the fact that the soya bean contains a specific enzyme called urease which has the power to convert urea into ammonium carbonate, but which has no effect upon any other nitrogenous constituent. In the presence of alkali the ammonia is liberated from the ammonium carbonate, and by the help of a current of air, is passed through a standard solution of acid. The amount of acid neutralised indicates the amount of ammonia present, and from this the urea can be calculated. Many preparations of soya bean are now obtainable but soya bean meal is the best to use because it keeps for a long time and can be prepared easily/

easily by passing some of the beans through a coffee machine. For each experiment 0.3 grm. of this meal was used and since it contains traces of ammonia it was found to neutralise almost 0.4 cc. of $\frac{1}{100}$ sulphuric acid.

The test was carried out in the following manner:-

Three cc. of blood were withdrawn from a vein at the bend of the elbow and thoroughly mixed with a small amount of powdered potassium oxalate in order to prevent coagulation taking place. By means of an air pump a current of air was drawn through a glass tube containing the 3 cc. of blood and 0.3 grms. of soya bean meal which had been placed in a water bath at 37°C. for fifteen minutes. In this manner the evolved ammonia was passed through another tube containing 25 cc. of centinormal acid. This acid was later neutralised by centinormal sodium hydroxide using an indicator made up of one drop of methyl red in 50 per cent alcohol. The difference between the 25 ccs. of acid originally taken and the number of ccs. of alkali used gave the number of ccs. neutralised by the ammonia evolved.

Each cc. of acid neutralised corresponds to 10 mgs. of urea.

The normal amount of urea in the blood varies between 20-40 mgs. of urea to 100 cc. of blood.

This/

This test is one of the most valuable in estimating renal efficiency but has the disadvantage that to be of use it must be carried out periodically, a point which is a serious disadvantage when the test has to be performed by a busy practitioner. Further in cases of subacute and chronic Bright's disease it gives no indication of kidney defect until the greater part of the kidney tissue is destroyed. Experiments upon animals have shown that three-quarters of the total renal substance may be removed before any accumulation of urea or non-protein nitrogen is found in the blood (Maclean[8]).

II. Non-Protein Nitrogen content of the Blood.

The process is a modification of Folin's method by Greenwald. It was performed in two stages in the usual way.

(a) Removal of protein and preparation of a clear filtrate from the blood.

(b) Estimation of nitrogen in a liquor part of filtrate by a modified Kjeldahl's process.

The filtrate was obtained in the following method.

To 3 cc. of blood diluted with 12 cc. of distilled water were added 15 cc. of a 10% trichloracetic acid solution. After thorough mixing this was allowed to stand in a closed vessel for half an hour; it was then/

then filtered through a small filter paper and a water-clear filtrate obtained. The filtration was slow but ultimately over 20 cc. were procured.

Estimation of the nitrogen in the filtrate was carried out as follows:- 10 cc. of filtrate were introduced into a hard glass tube together with 1 cc. of pure concentrated sulphuric acid and 3 drops five per cent copper sulphate solution. In order to prevent bumping, 0.1 grm. finely powdered pumice and two or three small beads were also added. This mixture was now boiled until excess of fluid was removed. A small flame was used and the tube was slanted in order to prevent loss of material. When the total bulk was reduced to about 3 cc. the tube was placed in the upright position and heated until the material began to clear. The position of the tube in the vertical direction ensured that the sides were well washed down.

At this stage 0.3 grm. of potassium sulphate was added and the heating continued for 15 minutes after the mixture cleared.

Owing to the presence of pumice stone the fluid never became quite transparent but it was easy to know when the reaction was completed. The mixture was now allowed to cool, but while still warm 6 cc. of distilled water were added; it was then cooled under the tap and was ready for distillation of the ammonia. This ammonia was liberated by the addition of 3 cc. saturated/

saturated potassium hydroxide solution, and distilled in a manner similar to that already described under Blood urea. Special precautions were taken to prevent the escape of ammonia owing to the addition of the alkali: titration was carried out with centinormal sodium hydroxide and 1 cc. centinormal sulphuric acid was regarded as being the equivalent of 0.00014 grm nitrogen.

The non-protein nitrogen varies considerably in different individuals, but the average amount is from 25-30 mgrs. per 100 cc. of blood. This is a somewhat lengthy estimation and requires especial care of the apparatus when not in use and therefore it is not to be recommended for general use.

III. Phenol-sulphone-phthalein Test.

This test may be described as one of the most popular of renal efficiency tests and was first introduced into clinical work by Rowntree and Geraghty in America[9]. Phenol-sulphone-phthalein is a dye which is introduced into the body and the amount excreted in the urine in a given time estimated. The solution of the dye employed is prepared by taking 0.6 grms. of phenol-sulphone-phthalein and 0.84 cc. of 2. N. sodium hydroxide and the technique of the test is as follows.

Half/

Half-an-hour before the test the patient was given a glass of water to drink to ensure free urinary secretion. Immediately before the test the bladder was emptied, then 1 cc. of a solution of the dye was injected into the muscles of the arm (Comrie[10]). After one and two hours respectively the bladder was emptied again and the amount of the dye excreted therein estimated separately by means of a comparison of the colour with a colorimeter. The colorimeter was obtained by making a standard solution consisting of 1 cc. of phenol-sulphone-phthalein diluted to a litre of water. The voided specimens of urine were made up to one litre of water and to each was added a little sodium hydroxide as an indicator. This test is not influenced by the amount of urine passed as it is always made up to one litre with water.

Many observers (e.g. Comrie,[11] Auld[12]) regard this as the most valuable individual renal test not only as an aid to the diagnosis of the renal condition but also as a criterion of the whole mechanism of absorption, circulation, and excretion of pigment. It is on this account that Comrie suggested the arm as the site of injection rather than into the muscles of the back where oedema is apt to arise, especially in cases which have been confined to bed for some time.

Comrie[13] places the following interpretations upon the excretions which take place during the first and second/

second hours after injection. An excretion which reaches seventy per cent or over gives a good prognosis as far as kidney function is concerned.

An excretion of fifty per cent in renal or cardiac disease denotes a condition which is compatible with complete restoration of health.

An excretion of about thirty per cent is compatible with prolonged life though on a low plane of vitality. When the excretion is below twenty per cent in spite of treatment a fatal termination may be expected within the year.

The reason why this test is not more often used in routine examinations for renal efficiency is because certain fallacies frequently occur through careless technique, and in this matter the value of the test is nullified.

These fallacies may be enumerated as follows:-

(a) That an exact cc. of the dye is not injected into the patient.

(b) That the same standard of phenol-sulphone-phthalein as the standardised solution is not always used in the test.

(c) The same amount of fluid is not given prior to the test to ensure free urinary secretion.

(d) The hours of taking the specimens are not rigorously kept.

(e)/

(e) Sometimes the presence of blood in a specimen gives rise to a useless reading. The first four of these fallacies are such that can be overcome by means of care, whilst the fifth may be eliminated by allowing the urine to sedimentise for twelve hours and then decant it, or it may be centrifuged. Either of the above methods will allow of an approximately accurate reading.

This test, though not now widely used, is undoubtedly one of value in following the progress of cases of chronic nephritis. Indeed Fressell & Vogel go so far as to claim that by plotting the course of a large number of cases it might be possible to arrive at an average expectation of life.

IV. Diastase Test.

This test depends on the presence of diastase, the ferment which changes starch into sugar, in the urine. This diastase is obtained from the blood which in turn gets it from the pancreas. Normally the blood contains a definite amount of diastase and when the kidneys are efficient from 6 to 30 units are excreted daily in the urine. In defective kidneys the amount is lower, depending upon the degree of deficient renal action. The diastatic activity of any specimen of urine is estimated in terms/

terms of the amount of starch which a definite volume of urine will change to sugar in a given time, the disappearance of the starch being indicated by the failure of the mixture of starch and urine to give a blue colour with Iodine. In the series of cases about to be discussed this test has been carried out in every instance, and it is proposed to describe the test in detail.

The technique of the Diastase Test is as follows:-

Three solutions are required for the test:-

i. A 0.1% soluble starch solution. This is prepared by heating 0.1 grm. soluble starch in a small amount of boiling water in a beaker, cooling and making the volume up to 100 cc.

ii. A solution of sodium chloride of 0.9% strength.

iii. A solution of iodine of about decinormal strength.

In carrying out the test five test tubes were taken and numbered one, two, three, four and five.
The following amounts of urine and saline solution were then added to each tube, the saline being sufficient to make up the total volume in each tube to 1 cc.
For measuring the fluids 1 cc. pipettes, graduated in 1/100ths, were most suitable.

Tube/

Tube No.	ccs. urine added.	ccs. saline added.
1	1 cc.	-
2	0.6	0.4 cc.
3	0.3	0.7 cc.
4	0.2	0.8 cc.
5	0.1	0.9 cc.

When the tubes were ready 2 cc. of 0.1% soluble starch solution were added to each from a burette. The mixture was then quickly shaken, the tubes put into an incubator or hot water at 37°C. and left there for exactly 30 minutes. They were then removed and filled to within ½ inch of the top with water. This stopped the ferment action. One drop of iodine was then added to each tube beginning at No.5. On shaking, it was generally found that No.5 tube and perhaps No.4 were still blue, but that No.3 was colourless or had only a faintly pink tinge. If so, No.3 tube contained just sufficient urine to change the 2 cc. of starch in 30 minutes. The empirical unit denoting this change was obtained by dividing 2 (the number of cc. of starch present) by the amount of urine in tube No.3. This tube contained 0.3 cc. urine therefore the diastatic value $= \frac{2}{0.3} = 6.6$.

For different tubes the units are:-

Tubes/

Tubes		Units
	1	3
	2	3.3
	3	6.6
	4	10
	5	20

Sometimes more than one drop of iodine had to be added, that was in cases where a fairly large quantity of urine was added.

This test is of value (Harrison and Lawrence[14]) in confirmation of other renal efficiency tests but the amount of pancreatic diastase excreted both by healthy persons and by nephritics varies within wide limits and in consequence the results are very erratic in nature and the test has accordingly lost favour (Comrie[15]). In addition it is troublesome to perform and on this account is not one which lends itself as an aid to a busy general practitioner.

V. Urea Concentration Test.

This test, introduced a few years ago by Maclean and De Wesselow, depends upon the fact that patients with defective kidneys are incapable of secreting urine with a high concentration of urea. The degree of the concentration of urea excreted is directly proportional to the amount of renal defect. This test was carried out as follows:-

The/

The patient was instructed to empty his bladder and was then given by mouth fifteen grams of urea dissolved in about a hundred cc. of water. He passed no urine until one hour after the urea had been taken, when he again emptied his bladder. This specimen was retained for analysis. A second specimen was also obtained from the patient.two hours after the urea had been taken. If the concentration of urea in the first specimen was two per cent or over, the condition was considered satisfactory, but if it was below this figure the specimen passed after two hours was examined.

In routine hospital work the specimen passed after the second hour was always examined, but in the case of out-patients a considerable amount of time may be saved by examining the first specimen. A concentration of 2% or over is regarded as evidence of an efficient kidney, any patient having less than 2% and more than 1.5% shows renal deficiency whilst those below 1.5% show the condition to be one of a serious nature.

Normally not more than 120 cc. of urine is passed in each hour and when this amount is exceeded it must be taken into account or a third hour specimen taken or even in some instances the test repeated.

The urea may be estimated by any recognised method but the one used in this series of cases was that recommended by Maclean[16] and it was always found to give/

give satisfactory results.

The apparatus consists of an ordinary 50 cc. graduated burette which has a glass tap fixed at its upper end. This burette is connected by a rubber tubing with a bottle containing the urine and hypobromite solution. The lower end of the burette is attached by rubber tubing to a bell-shaped vessel large enough to hold all the water displaced by the nitrogen evolved from the decomposition of the urine by the hypobromite solution, which is made up as follows:-

A 100 grains of sodium hydroxide to 250 cc. of water. 23 cc. of this solution is taken and to it is added 2 cc. of bromine for each test. As the solution is apt to undergo chemical change it is imperative that a freshly mixed solution should be used. Before the estimation is commenced water is poured into the bell-shaped vessel until it is about three-quarters full. No air bubbles should be left in the rubber tube. The water rises in the burette until it is the same level as in the bell-shaped vessel which now rests upon an adjustable support.

The estimation was carried out in the following manner:-

Twenty-five cc. of sodium hydroxide were placed into a bottle and also a small test tube containing 4 cc. of the urine to be examined, the latter in such a/

a way that it did not mix with the former solution. The glass tap at the top of the burette was now opened and a rubber stopper placed securely in the bottle. The bell-shaped vessel was now raised until the water in the burette reached the zero mark. Keeping the level at zero the tap was closed and the vessel replaced on its support. The urine and hypobromite solution were now mixed by shaking the bottle, which contained them both, for about half-a-minute. The urine decomposed and nitrogen was evolved. This nitrogen entered the burette and drove the water back into the vessel. After being allowed to stand for a further half-minute the bell-shaped vessel was moved again in order to make the level of the water in the burette correspond with the level of the water which it itself contained. Now the number of cubic centimetres of gas was read off on the burette and the urea percentage calculated from Maclean's table[17]. In this table 8 ccs. of nitrogen are considered to be the equivalent of 0.5% of urea.

A copy of the table is given below:-

TABLE./

Nitrogen cc.	Urea Percent.	Nitrogen cc.	Urea Percent.	Nitrogen cc.	Urea Percent	Nitrogen cc.	Urea Percent.
8.0	0.5	22.4	1.40	36.8	2.30	51.2	3.20
8.8	0.55	23.2	1.45	37.6	2.35	52.0	3.25
9.6	0.60	24.0	1.50	38.4	2.40	52.8	3.30
10.4	0.65	24.8	1.55	39.2	2.45	53.6	3.35
11.2	0.70	25.6	1.60	40.0	2.50	54.4	3.40
12.0	0.75	26.4	1.65	40.8	2.55	55.2	3.45
12.8	0.80	27.2	1.70	41.6	2.60	56.0	3.50
13.6	0.85	28.0	1.75	42.4	2.65	56.8	3.55
14.4	0.90	28.8	1.80	43.2	2.70	57.6	3.60
15.2	0.95	29.6	1.85	44.0	2.75	58.4	3.65
16.0	1.00	30.4	1.90	44.8	2.80	59.2	3.70
16.8	1.05	31.2	1.95	45.6	2.85	60.0	3.75
17.6	1.10	32.0	2.00	46.4	2.90	60.8	3.80
18.4	1.15	32.8	2.05	47.2	2.95	61.6	3.85
19.2	1.20	33.6	2.10	48.0	3.00	62.4	3.90
20.0	1.25	34.4	2.15	48.8	3.05	63.2	3.95
20.8	1.30	35.2	2.20	49.6	3.10	64.0	4.00
21.6	1.35	36.0	2.25	50.4	3.15		

The above table shows the percentage of Urea equivalent to the Cubic Centimetres of Nitrogen evolved when 4 cc. of urine is acted upon by 25 cc. of hypobromite solution.

This test is regarded as one of the most valuable in connection with renal efficiency and has the advantages of being easy to perform, harmless and requires no technical knowledge. Repeated tests of this description give valuable aid as to the progress of the case. It occasionally has the disadvantage of diuresis but this is seldom and can usually be nullified in the manner mentioned above.

VI. Other Tests.

Many other tests for the estimation of renal efficiency as regards prognosis and diagnosis have been tried from time to time during the past few years. Among these tests now mostly discarded are the coefficient of Ambard, the test meal or excretion fixation method, the chloride content of urine and blood and the estimation of the power of the kidney to concentrate uric acid.

The coefficient of Ambard is a figure representing the relation between the amount of urea in the blood and the urea excreted daily in the urine. Many objections have been raised against this method:- namely by Chase and Myers[18] and by Maclean[19] that the test does not give information beyond that obtainable by the estimation of blood urea. Other writers (Addis and Watamabe[20]) assert that the rate of urea excretion/

excretion is not dependent upon its concentration in the blood and urine and thus the test is unreliable.

The Test Meal method described by Lewis and Mosenthal[21] involves a careful collection of all urine at two hourly intervals throughout the day and night with rigid adherence to meal times; thus it lends itself to fallacies. It is, however, easy to carry out and consists of a comparison between day and night urine as regards specific gravity and quantity. This test though simple is tedious and not one which could be recommended for use in a general practice

The Chloride content of urine and blood.

The function of the kidney is not entirely restricted to the elimination of waste products, but it fulfils another important office in regulating the concentration of salts in the plasma which is, normally, 0.6 grms. to each 100 cc. of fluid in the body. The most easily estimated salt is sodium chloride and since the bulk of these salts is represented by this salt the chloride estimation in the urine and blood is given in terms of sodium chloride.

The method generally employed was to give the patient 10-15 grammes of sodium chloride by mouth and then estimate the amount passed in the urine in the manner described by Volhard.

The/

The test is not considered (Vallery-Radot[22]) to be of great value as it has been shown that the injection of a large amount of salt does not necessarily mean that an equivalent amount would be excreted by a normal individual.

Maclean[23] emphasises the fact that retention of sodium chloride in a healthy person does not lead to an increase of sodium chloride in the blood but rather to increased fluid retention in order to maintain the body fluid at a constant level.

In healthy persons this salt retention only lasts a few days after which it is passed in the urine in amounts equal to those taken by the mouth. In nephritic patients this does not take place, but instead the fluids go on increasing and oedema and ascites follow.

The power of the kidney to concentrate Uric Acid.

A person with healthy kidneys has a uric acid percentage in the urine twenty times as great as that in the blood, whilst cases of nephritis may show a concentration figure of fourteen or even lower. This test consists of estimating the amount of uric acid in the blood and in the urine after a certain standard diet. The method of Benedict and Hitchcock is used in these estimations but they are too complicated for this test to be of any clinical value.

These tests were carried with a view of finding a test of value, simple and one which could be carried out by a general practitioner with ordinary facilities.

COMPARISON OF THE RENAL EFFICIENCY TESTS MENTIONED.

1. The Blood Urea Test.

One of the great disadvantages of this test is that to be of value it must be carried out periodically. Further it is stated that it does not give any indication of impaired renal function in subacute or chronic Bright's disease until the greater part of the kidney tissue is destroyed. It is, however, a valuable test for renal efficiency but is more adaptable to hospital use than to use in a general practice.

2. The Non-Protein Nitrogen content of the Blood Test.

This test was discarded on account of the lengthy estimation required to determine the renal efficiency and because of the special attention which the apparatus required when not in use.

3. The Phenol-sulphone-phthalein Test.

This test is regarded as a very useful test for renal efficiency but was discarded for the following reasons:-

1. That an exact cc. of the dye is not always injected into the patient.

2./

2. That the same standard of phenol-sulphone-phthalein as the standardised solution is not always used in the test.
3. The hours of taking the specimens are not rigorously kept.
4. Sometimes the reading is rendered difficult by the presence of blood.

Whilst it is admitted that all the above fallacies can be overcome in a hospital, they must be regarded as a greater obstacle to the general practitioner.

4. The Diastatic Test.

This test was found to be very erratic and somewhat troublesome to perform. Though carried out on each of the patients in the present series no great stress was laid upon the results obtained from it.

5. The Urea Concentration Test of Maclean & De Wesselow.

This test has the advantage that it is of value in estimating renal efficiency, and that it is harmless to the individual. The necessary apparatus requires no special care when not in use and the test no technical skill to perform. The chief fallacy found in connection with this test was that in some patients there was the tendency of diuresis - a condition however which could generally be overcome by the examination of a third hour specimen or by repetition of the test.

6. Coefficient of Ambard.

This test, although mentioned in this series, was not actually carried out. It is held that it gives no information beyond that obtainable by examination of the blood urea. Also that the rate of urea excretion is not dependant upon its concentration in the blood and urine - thus rendering the test unreliable. The estimation of renal efficiency is only obtained in this method after a lengthy mathematical problem has been solved, thus rendering the test of little use to the general practitioner.

7. The Test Meal Method.

Since this test necessitates the collection of all urine passed, at two hourly intervals, during the day and night, with rigid adherence to meals it will be observed that it extends over too long a period to be of use to the general practitioner. It is, however, a very simple test and of value in institutions where a strict compliance with the requirements can be carried out.

8. The Chloride content of Urine and Blood.

This test was discarded on the grounds that the injection of a large amount of salt into a nephritic patient was not excreted but tended to result in an increase in oedema and ascites.

9. The power of the kidney to concentrate Uric Acid.

The estimations required in connection with this test were considered to be far too complicated for the test to be of practical value.

The urea concentration test of Maclean and De Wesselow was the test chosen for routine examination on account of its value as an aid to diagnosis and prognosis, and on account of its extreme simplicity to perform.

---

3. A REVIEW OF TWO HUNDRED CASES.

In every instance the following data were obtained:-

1. Patient's own statement as to cause.
2. Length of service.
3. Previous illnesses.
4. Previous occupation.
5. The general condition of the patient.
6. The presence or absence of oedema.
7. The condition of the cardio-vascular system and estimation of blood pressure.
8. The Wassermann reaction of the blood serum.
9. Routine examination of the urine with a view to discerning the presence or absence of albumin, of casts and of red blood corpuscles.
10. The urea concentration test, after the method of Maclean and De Wesselow was carried out in every instance.
11. The diastatic test was also carried out.

The stated causes, length of service, previous illnesses, and previous occupations have all been tabulated and will be discussed and shown below. The general condition of the patient and the presence or absence of oedema was estimated by ordinary clinical examination. The cardio-vascular system was examined fully/

fully, paying particular attention to the condition of the heart with regard to size, condition of the valves and position of the apex beat. The arteries were examined in order to ascertain the degree of arterio-sclerosis present, if any, and in every instance the blood pressure was made by means of a modified Riva-Rocci sphygmanometer using the auscultatory method. The Wassermann reaction was carried out in every instance upon the blood serum. The examination of urine for protein was carried out by means of salicyl-sulphonic acid, a suitable solution of which is composed by 25 grammes of salicyl-sulphonic acid dissolved in 100 cc. of water. This forms a simple and accurate test which only requires the addition of a few drops of the solution to about half-an-inch of urine in a test tube. In the presence of protein a white precipitate is formed; if only a very small amount of albumin is present a faint opalesence is produced. This test is an extremely delicate one and a urine which does not give any reaction may be regarded as being protein free. The urine must be acid in reaction for this test and where alkaline must be rendered acid by the addition of a few drops of acetic acid.

The presence or absence of red blood corpuscles and of casts were examined for after centrifuging a small quantity of urine. In making a film for examination a small amount of sediment at the bottom of the centrifuge/

centrifuge tube was taken up with a pipette and a few drops of the mixture spread out over a glass slide in a fairly thick layer. It was then examined under the microscope. No cover glass was used and it is important to use as small a diaphragm as possible, whilst $\frac{2}{3}$ or $\frac{3}{4}$ inch objective was found to be most suitable. A mechanical stage was a valuable aid.

It will be noted that the chief varieties of casts found were epithelial, hyalo-granular and hyaline.

The method of carrying out the urea concentration and diastatic tests has already been described.

The series of cases under discussion are now presented, arranged into four groups according to age.

The first is composed of patients aged between 21 and 30 inclusive; the second group of patients aged between 31 and 40 inclusive; the third group of patients aged between 41 and 50 inclusive; the fourth group of patients aged 51 years and upwards.

GROUP ONE.

No. of Case.	Service.	Casts.	Red Blood Cells.	Specific Gravity.	Albumin.	Oedema.	Blood Pressure.	Arteries.	Wassermann Reaction.	Heart.	Urea Concentration Test.	cc. of urine passed in second hour.	Diastatic test.	Occupation, Ascribed cause and General Remarks.
1.	3 yr	-	+	1014	++	-	120/85	-	N	A.B. 5th space N.L. 2nd Aortic sound - .	2.6	84	6.6	Labourer. Exposure. Renal Efficiency Good.
2	3¼ yr.	Hy. Gr.	+	1024	+++	-	142/110	-	N	A.B. 5th Space N.L.	2.35	120	10	Miner. Exposure. Renal Efficiency good.
3	2 yr	Hy. Gr.	+	1024	+++	-	120/80	-	N	A.B. 5th Space Int. N.L.	2.5	80	6.6	Commercial traveller. Exposure. Renal efficiency good.
4	3 yr	-	-	1010	Trace	-	138/86	-	N	A.B. 5th space. Int. N.L.	3.3	90	3.3	Set Maker. Exposure. Twice under observation. Renal efficiency good.
5	7 yr	Hy. Gr.	-	1032	-	-	142/92	-	N	A.B. 5th space. Int. N.L.	4.2	116	10	Fisherman. Chill. Renal efficiency good.
6	2 yr	Hy.	-	1030	-	-	120/90	-	N	A.B. 5th space. Int. N.L.	2.8	90	10	Miner. Exposure. Renal efficiency good.
7	3 yr	-	+	1022	Trace Pus	-	132/94	-	N	A.B. 5th space. Int. N.L.	2.8	71	20	Rubber Worker. Exposure. Renal efficiency good. Old gonococcal infection.
8	3 yr	Hy.	-	1020	-	-	120/90	-	N	A.B. 5th space Int. N.L.	2.4	95	10	Porter. Exposure. Renal efficiency good.
9	2½ yr.	-	-	1016	-	-	140/110	-	N	A.B. 5th space Int. N.L.	3.1	52	6.6	Crofter. Exposure Renal efficiency good.
10	7/12 yr	-	+	1014	++	-	165/95	-	N	A.B. 5th space. Int. N.L. 2nd Aortic sound -	2.5	60	20	Poultry Farmer. Exposure. Renal efficiency good.

No. of Case.	Service.	Casts.	Red Blood Cells.	Specific Gravity.	Albumin.	Oedema.	Blood Pressure.	Arteries.	Wassermann Reaction.	Heart.	Urea Concentration Test.	cc. of urine passed in second hour.	Diastatic test.	Occupation, Ascribed cause and general remarks.
11	3 yr	Hy.	-	1018	+	-	142/86	++	N	A.B. 5th space Int. N.L. 2nd Aortic sound -	2.05	140	6.6	Labourer. Exposure. Renal efficiency good. Diuresis present.
12	2 yr	-	-	1020	++ Pus	-	125/85	-	N	A.B. 5th space. Int. N.L.	3.07	85	20	Distillery Worker. Rheumatism. Renal efficiency good.
13	2 yr	Hy. Gr.	++	1010	+++	++	160/100	-	P	A.B. 5th space N.L. Aortic & mitral incompetence	1.4	106	3.3	Porter. Rheumatic Fever. Discussed later in detail.
14	6 yr	Hy. Gr.	+	1012	+++	-	124/100	++	N	A.B. 5th space. Int. N.L.	1.45	76	6.6	Joiner. Exposure. Renal efficiency poor.
15	3 yr	Hy. Gr.	-	1014	++	+	165/90	-	N	A.B. 5th space Int. N.L.	2.3	98	6.6	Labourer. Exposure. Renal efficiency satisfactory.
16	4 yr	-	-	1006	+	+	158/100	+	N	A.B. 5th space. Int. N.L.	0.56	60	2	No occupation. Injury. Discussed in detail later.
17	4 yr	Hy. Gr.	-	1014	++	-	130/95	-	N	A.B. 5th space Int. N.L.	1.08	100	3.3	Miner. Exposure. Tubercle bacilli present in sputum.
18	3 yr	-	-	1016	+	-	110/75	-	N	A.B. 5th space Int. N.L.	1.28	70	3.3	Farmer. No cause given. Renal efficiency poor.
19	4 yr.	-	-	1016	Trace at times	-	105/95	-	N	A.B. 5th space Int. N.L.	2.75	90	10	Miner. Exposure. Renal efficiency good.
20	2 yr	Ep. Hy.	++	1024	+++	-	160/100	+	N	A.B. 5th space Int. N.L. 2nd Aortic sound -	1.9	60	6.6	Miner. Trench Fever. Readmitted at later date when the tests and general condition were much improved.

No. of Case.	Service.	Casts.	Red Blood Cells.	Specific Gravity.	Albumin.	Oedema	Blood Pressure.	Arteries.	Wassermann Reaction.	Heart.	Urea Concentration Test.	cc. of urine passed in second hour.	Diastatic test.	Occupation ascribed cause and general remarks.
21	2 yr	Ep.	+	1016	+ Trace	-	110/75	+	N	A.B. 5th space Int. N.L.	2.4	80	6.6	Miner. Exposure. Renal efficiency good.
22	1 yr	-	+	1022	- Pus	-	110/75	-	N	A.B. 5th space Int. N.L. 2nd aortic sound -	2.016	120	20	Porter. No cause given. Renal efficiency good.
23	3 yr	-	+	1018	+	-	85/60	+	N	A.B. 5th space Int. N.L.	2.5	70	6.6	Miner Exposure. Renal efficiency good.
24	4 yr	-	+	1024	+	-	130/70	-	N	A.B. 5th space Int. N.L. 2nd Aortic sound -	3.24	75	6.6	Chemist. Exposure. Renal efficiency good.
25	1 yr	Hy. Gr.	-	1012	+	-	215/65	-	N	A.B. 6th space. $4\frac{1}{2}$" from M.S.L.	0.56	84	3.3	Engineer. No cause given. Renal efficiency bad. Marked cardiac disease present.
26	3 yr.	Hy.	+	1010	+	+	130/90	-	N	A.B. 5th space Int. N.L.	2.46	95	3.3	Plumber. Exposure. Renal efficiency good.
27	2 yr	Hy.	+	1010	+	++	110/70	-	N	A.B. 5th space Ext. N.L.	1.45	100	3.3	Rubber Worker. Rheumatic Fever. Renal efficiency poor. Marked cardiac disease present.
28	2 yr	Hy. Ep.	+	1006	++ Pus	+++	175/115	+	N	A.B. 5th space N.L.	0.616	65	2	No occupation. Influenza. Died. Case discussed in detail later.
29	7 yr	-	-	1022	-	+	137/90	+	N	A.B. 5th space Int. N.L. 2nd aortic sound -	2.5	110	3	Roadman. Exposure. Renal efficiency good.
30	2 yr	-	-	1026	-	-	120/70	-	N	A.B. 5th space. N.L.	2.3	60	20	Labourer. No cause given. Renal efficiency good.

No. of Case.	Service.	Casts.	Red Blood Cells.	Specific Gravity.	Albumin.	Oedema.	Blood Pressure.	Arteries.	Wassermann Reaction.	Heart.	Urea Concentration Test.	cc. of urine passed in second hour.	Diastatic test.	Occupation, ascribed cause and general remarks.
31	3 yr	-	-	1008	+	-	110/70	-	N	A.B. 4th space Int. N.L.	2.5	60	3.3	Fireman. No cause given. Renal efficiency good. Patient had gonorrhoeal infection.
32	4 yr	-	-	1022	+	-	130/80	-	N	A.B. 5th space Int. N.L.	3.65	75	10	Miner. No cause given. Renal efficiency good. Tubercle bacilli found in sputum.
33	2 yr	-	-	1026	+	-	132/84	-	N	A.B. 5th space. Int. N.L.	2.29	80	6.6	Fisherman. Exposure. Renal efficiency good.
34	2 yr	-	-	1026	+ Pus	-	120/80	-	N	A.B. 5th space Int. N.L.	3.2	80	10	Printer. No cause given. Renal efficiency good.
35	5 yr	Hy.	++	1018	++	+	120/90	-	N	A.B. 5th space Int. N.L.	3.4	82	20	Medical Student. Influenza. Renal efficiency good. Cystocopic examination showed obstruction to right ureter, otherwise nil.
36	3 yr	-	-	1012	++	+	158/96	++	N	A.B. 5th space Int. N.L.	2.1	50	6.6	Labourer. Typhoid Fever. Renal efficiency good.
37	3 yr	-	-	1014	Pus	-	135/80	-	N	A.B. 5th space Int. N.L.	2.1	84	10	Fisherman. No cause given. Renal efficiency good.
38	3 yr	Hy. gr. Ep.	+	1010	+++	++	190/120	+++	N	A.B. 5th space N.L. Sounds accentuated.	1.4	108	3.3	Labourer. No cause given. Renal efficiency poor.
39	1 yr	-	+	1022	+ Pus	-	160/110	-	N	A.B. 5th space Int. N.L.	2.25	76	3.3	Labourer. No cause given. Renal efficiency good. X-ray confirmed diagnosis of renal calculus.
40	2 yr	-	-	1014	+	-	130/82	-	N	A.B. 5th space. Int. N.L.	1.8	64	10	Sardiner. Exposure. Renal efficiency fair.

No. of Case.	Service.	Casts.	Red Blood Cells.	Specific Gravity.	Albumin.	Oedema.	Blood Pressure.	Arteries.	Wassermann Reaction.	Heart.	Urea Concentration Test.	cc. of urine passed in second hour.	Diastatic test.	Occupation, ascribed cause and general remarks.
41	3 yr	-	-	1008	-	-	140/90	-	N	A.B. 4th space Int. N.L.	1.9	140	3.3	Farm hand. No cause given. Renal efficiency fair. Diuresis after urea.
42	2 yr	-	-	1027	-	-	90/70	+	N	A.B. 5th space Int. N.L.	3.10	80	10	Clerk. No cause given. Renal efficiency good. A case of Diabetes discussed later.
43	1 yr	-	+	1010	+ Pus	-	130/80	-	N	A.B. 5th space Int. N.L.	1.95	65	3.3	Farm labourer. No cause given. Renal efficiency fair.
44	2 yr	-	-	1016	+	-	125/70	-	N	A.B. 5th space N.L.	2.65	56	3.3	Ship-yard Worker. Bronchitis. Renal efficiency good.
45	2 yr	-	-	1020	-	-	126/75	-	N	A.B. 5th space Int. N.L.	3.25	60	6.6	Motor Mechanic. Exposure. Renal efficiency good. Test repeated on account of diuresis.
46	3 yr	-	-	1020	-	-	130/75	-	N	A.B. 5th space Int. N.L.	2.05	80	6.6	Sail maker. No cause given. Renal efficiency good. Considered to be a case of Pulmonary Tuberculosis.
47	3 yr	-	-	1020	+	-	135/85	-	N	A.B. 5th space Int. N.L.	3.15	100	3.3	Miner. No cause given. Renal efficiency good.
48	1 yr	Hy. Hy. gr.	++	1020	+++	+	140/90	-	N	A.B. 5th space Int. N.L.	1.75	92	3.3	Miner. Exposure. Renal efficiency poor.
49	2 yr	-	+	1022	-	-	125/80	-	N	A.B. 5th space Int. N.L.	3.15	78	6.6	Poultry farmer. No cause given. Renal efficiency satisfactory.
50	3 yr	Hy gr. Gr.	-	1026	+++	+	108/72	-	N	A.B. 5th space Int. N.L.	0.5	106	2	No occupation. No cause given. Renal efficiency bad. Died. Discussed later.

No. of Case.	Service.	Casts.	Red Blood Cells.	Specific Gravity.	Albumin.	Oedema.	Blood Pressure.	Arteries.	Wassermann Reaction.	Heart.	Urea Concentration Test.	cc. of urine passed in second hour.	Diastatic.	Occupation, ascribed cause and general remarks.
51	6/12 yr	Hy. Gr.	-	1028	+	-	140/80	-	P	A.B. 6th space N.L.	2.65	55	6.6	Ploughman. Rheumatism. Renal efficiency good. Test repeated on account of diuresis. Mitral and Aortic Incompetence present.
52	3 yr	-	+	1016	+	-	120/75	-	N	A.B. 5th space Int. N.L.	2.5	52	2	Farm Labourer. No cause given. Renal efficiency good.
53	2 yr	Waxy Ep.	++	1012	+++ Pus	++	170/110	+	N	A.B. 5th space Int. N.L.	0.85	55	2	No occupation. Exposure. Renal efficiency bad. Died. Discussed later.
54	2 yr	-	+	1012	++ Pus	-	145/92	-	N	A.B. 5th space Int. N.L.	1.3	128	6.6	Labourer. Exposure. Renal efficiency poor.
55	3 yr	Hy. Gr.	-	1010	++	+	145/90	-	P	A.B. 5th space Int. N.L.	0.75	178	2	Railway Engine Cleaner. Chill. Renal efficiency poor. Marked diuresis after urea.
56	4 yr	Hy. gr.	-	1020	+	+	142/80	-	N	A.B. 5th space Int. N.L.	2.55	86	3.3	Labourer. Chill. Renal efficiency good.
57	1 yr	-	+++	1018	+	-	140/70	-	N	A.B. 5th space Int. N.L.	2.25	90	10	Plate layer. No cause given. Renal efficiency good. Renal calculus in left kidney.
58	1 yr	Hy	-	1020	+ at times	-	130/80	-	N	A.B. 5th space Int. N.L.	2.8	70	6.6	Crofter. No cause given. Renal efficiency good. Pulmonary fibrosis present.
59	3 yr	-	-	1006	+ at times	-	110/80	-	N	A.B. 5th space Int. N.L.	2.2	74	2	Medical Student. No cause given. Renal efficiency good.
60	5 yr	-	-	1026	+ at times	-	110/65	-	N	A.B. 5th space Int N.L.	3.4	82	10	No occupation. No cause given. Renal efficiency good. Condition of G.S.W. chest with resultant fibrosis.

No. of Case.	Service.	Casts.	Red Blood Cells.	Specific Gravity.	Albumin.	Oedema.	Blood Pressure.	Arteries.	Wassermann Reaction.	Heart.	Urea Concentration Test.	cc. of urine passed in second hour.	Diastatic test.	Occupation, ascribed cause and general remarks.
61	5 yr	-	-	1016	-	-	130/80	-	N	A.B. 5th space N.L.	1.75	68	6.6	Clerk. No cause given. Renal efficiency fair. Mitral Incompetence present.
62	3 yr	-	-	1010	+ Trace	-	120/85	-	N	A.B. 5th space Ext. N.L.	1.5	96	3.3	Brewer. No cause given. Renal efficiency fair.

GROUP TWO.

1	2 yr	Hy.	-	1010	+	-	165/135	+	N	A.B. 5th space N.L.	1.0	100	6.6	Labourer. Exposure. Renal efficiency poor.
2	4 yr	-	-	1018	-	-	145/90	++	P	A.B. 5th space Int. N.L.	2.07	60	10	Mill worker No cause given. Renal efficiency good. Discussed later.
3	4 yr	-	-	1020	+	+	140/90	-	N	A.B. 5th space Int. N.L.	2.1	73	6.6	Motor driver. Rheumatism. Renal efficiency good.
4	3 yr	-	-	1020	+	-	126/74	-	N	A.B. 5th space Int. N.L.	2.2	80	6.6	Fisherman. Exposure. Renal efficiency good.
5	5 yr	-	-	1024	+	-	110/85	-	P	A.B. 5th space Int. N.L.	2.6	75	10	Miner. Exposure. Renal efficiency good. A case of secondary syphilis.
6	4 yr	-	-	1012	+	-	110/72	-	N	A.B. 5th space Int. N.L.	2.35	82	10	Farm-servant. Exposure. Renal efficiency good.
7	5 yr	-	+	1022	+ Pus	-	130/85	-	N	A.B. 5th space Int. N.L.	2.4	73	10	Carter. Exposure. Renal efficiency good.

No. of Case.	Service.	Casts.	Red Blood Cells.	Specific Gravity.	Albumin.	Oedema.	Blood Pressure.	Arteries,	Wassermann Reaction.	Heart.	Urea Concentration Test.	cc. of urine passed in second hour.	Diastatic test.	Occupation, ascribed cause and general remarks.
8	6 yr	-	-	1016	+	-	120/70	-	N	A.B. 5th space Int. N.L.	1.3	150	10	Grocer. Exposure. Renal efficiency fair. Diuresis after urea.
9	4 yr	Ep.	-	1026	+	-	140/95	+	N	A.B. 5th space Int. N.L.	2.3	60	6.6	Labourer. Wet. Renal efficiency good. Arterio-sclerosis present.
10	10 yr	-	-	1020	+	-	100/54	-	N	A.B. 5th space Int. N.L. Sounds faint.	2.4	45	10	Farmer. No cause given. Renal efficiency good. Addison's disease.
11	4 yr	Hy. Gr.	+	1012	++	-	140/70	-	N	A.B. 5th space N.L.	1.4	60	3.3	School Janitor. Malaria. Renal efficiency poor.
12	2 yr	-	+	1016	+	-	110/80	-	N	A.B. 5th space Int. N.L.	2.5	75	6.6	Groom. Exposure. Renal efficiency good. Extensive fibrosis of right lung.
13	2 yr	-	-	1028	+ Pus	-	120/80	-	N	A.B. 5th space Int. N.L.	2.29	100	10	Miner. Exposure. Renal efficiency good.
14	2 yr	-	-	1012	-	-	120/95	+	N	A.B. 5th space Int. N.L.	2.46	80	10	Miner. Exposure. Renal efficiency good. Fibroid changes in both lungs.
15	4 yr	Ep.	-	1022	-	-	140/90	-	N	A.B. 5th space Int. N.L.	2.35	70	6.6	Labourer. Exposure. Renal efficiency good.
16	2 yr	Ep.	+	1018	+	+	130/70	+	N	A.B. 5th space Int. N.L.	1.8	90	10	Miner. Exposure. Renal efficiency fair. Cardiac sounds accentuated.

No. of Case.	Service.	Casts.	Red Blood Cells.	Specific Gravity.	Albumin.	Oedema.	Blood Pressure.	Arteries.	Wassermann Reaction.	Heart.	Urea Concentration Test.	cc. of urine passed in second hour.	Diastatic test.	Occupation, ascribed cause, general remarks.
17	4 yr	-	+	1014	+	-	120/80	-	P	A.B. 5th space Int. N.L.	2.2	110	6.6	Miner. Exposure. Renal efficiency good.
18	2 yr	-	+	1006	+	-	160/105	+	P	A.B. 5th space Int. N.L.	2.24	94	20	Miner. Exposure. Renal efficiency good. Arterio sclerosis syphilitic in origin.
19	12 yr	Gr.	-	1018	+ Pus	+	150/100	++	N	A.B. 5th space Int. N.L.	0.95	100	3	Labourer. No cause given. Renal efficiency poor Old standing gonorrhoeal infection.
20	4 yr	Hy. Gr.	+	1026	+	+	142/96	-	N	A.B. 5th space Int. N.L.	2.4	80	6.6	Fisherman. Exposure. Renal efficiency good.
21	4 yr	Hy. Gr.	+	1014	+ Pus	+	150/98	++	P	A.B. 5th space N.L.	2.15	125	6.6	Miner. Exposure. Renal efficiency good Slight diuresis.
22	5 yr	-	-	1024	-	-	140/80	-	N	A.B. 5th space N.L.	2.75	75	20	Asylum Attendant. Malaria. Renal efficiency good
23	3 yr.	Hy. Hy. gr.	+	1008	++	+	126/96	-	N	A.B. 5th space Int. N.L.	0.75	92	3.3	Labourer. Exposure. Renal efficiency bad. Cardiac sounds accentuated.
24	10 yr	Hy. gr.	-	1012	+	-	135/96	-	N	A.B. 5th space N.L.	2.4	72	3.3	Labourer. No cause given. Renal efficiency good
25	3 yr	-	-	1030	-	-	130/80	-	N	A.B. 5th space Int. N.L.	2.75	85	3.3	Roadman. Exposure. Renal efficiency good
26	2 yr	-	-	1022	+	-	140/80	-	P	A.B. 5th space Int. N.L.	2.25	30	10	Fisherman. Exposure. Renal efficiency good.

No. of Case.	Service.	Casts.	Red Blood Cells.	Specific Gravity.	Albumin.	Oedema.	Blood Pressure.	Arteries.	Wassermann Reaction.	Heart.	Urea Concentration Test.	cc. of urine passed in second hour.	Diathatic test.	Occupation, ascribed cause and general remarks.
27	4 yr	-	-	1020	+	-	135/75	-	N	A.B. 5th space Int. N.L.	2.05	90	6.6	Motor-driver. Enteric Fever. Renal efficiency good.
28	1 yr	-	-	1020	+ Pus	-	130/85	-	N	A.B. 5th space Int. N.L.	2.45	90	10	Fisherman. Chill. Renal efficiency good.
29	4 yr	Hy. gr.	+	1018	+	-	135/80	-	N	A.B. 5th space Int. N.L.	2.25	30	10	Rubber Worker. Bronchitis. Renal efficiency good.
30	2 yr	-	-	1016	-	-	120/80	-	N	A.B. 5th space Int. N.L.	2.4	80	6.6	Labourer. Exposure. Renal efficiency good.
31	3 yr	Hy. gr.	-	1010	+ Pus	-	140/100	-	N	A.B. 5th space ½" Ext. N.L.	1.0	100	20	Draper. Malaria. Renal efficiency poor. Cardiac sounds accentuated.
32	4 yr	Hy.	-	1026	-	-	110/80	-	N	A.B. 5th space Int. N.L.	2.19	80	6.6	Miner. Exposure. Renal efficiency good.
33	5 yr	-	-	1012	+	-	120/80	-	N	A.B. 5th space Int. N.L.	2.0	90	6.6	Hatter. No cause given. Renal efficiency good.
34	2 yr	-	-	1016	+	-	140/86	-	N	A.B. 5th space Int. N.L.	2.5	100	6.6	Jute Worker. Exposure. Renal efficiency good. Tubercle bacilli found in sputum.
35	1 yr	-	+	1014	+ Pus	-	140/96	-	N	A.B. 5th space Int. N.L.	1.9	90	3.3	Fisherman. No cause given. Renal efficiency fair. Urethral stricture.
36	13 yr	-	-	1016	+ Pus	-	120/76	+	N	A.B. 5th space Int. N.L.	2.2	94	3.3	Miner. Lead smelting white a prisoner. Renal efficiency good. Pulmonary Fibrosis.
37	3 yr	-	-	1024	-	-	142/76	-	N	A.B. 6th space. ½" Ext. N.L.	2.5	114	6.6	Corporation labourer. No cause given. Renal efficiency good. Cardiac hypertrophy and Mitral Incompetence.

No. of Case.	Service.	Casts.	Red Blood Cells.	Specific Gravity.	Albumin.	Oedema.	Blood Pressure.	Arteries.	Wassermann Reaction.	Heart.	Urea Concentration Test.	cc. of urine passed in second hour.	Diastatic test.	Occupation, ascribed cause and general remarks.
38	2 yr	-	-	1020	+ Pus	-	125/80	-	N	A.B. 5th space Int. N.L.	3.1	42	6.6	Clerk. Exposure. Renal efficiency good.
39	4 yr	-	-	1022	+	-	125/75	-	N	A.B. 5th space Int. N.L.	3.3	76	3.3	Labourer. No cause given. Renal efficiency good.
40	2 yr	-	-	1014	+ Pus	-	120/90	-	N	A.B. 5th space ½" Ext. N.L.	2.12	84	6.6	Miner. No cause given. Renal efficiency good. Fibrosis both lungs.
41	4 yr	-	-	1018	+ Pus	+	150/100	++	N	A.B. 5th space in N.L.	1.0	80	3.3	Miner. Exposure. Renal efficiency poor. Second aortic sound accentuated.
42	3 yr	-	-	1012	+ Pus	-	130/80	-	N	A.B. 5th space Int. N.L.	3.4	50	3.3	Rabbit-catcher. Exposure. Renal efficiency good.
43	18 yr	Hg.	-	1018	+	-	108/74	-	N	A.B. 5th space N.L.	1.8	90	6.6	Old soldier. Exposure. Renal efficiency poor.
44	5 yr	Gr.	+	1010	++	-	140/98	++	P	A.B. 5th space N.L.	1.9	98	2	Miner. Exposure. Renal efficiency poor. Arterio-sclerosis present.
45	1 yr.	Hy. gr.	+	1014	+++	+++	138/80	+	N	A.B. 5th space. Int. N.L.	0.75	108	3.3	Letter-press printer. Exposure. Renal efficiency bad.
46	2 yr	-	-	1016	-	-	140/80	-	N	A.B. 5th space. Int. N.L.	2.25	80	6.6	Gardener. Exposure. Renal efficiency good.

No. of Case.	Service.	Casts.	Red Blood Cells.	Specific Gravity.	Albumin.	Oedema.	Blood Pressure.	Arteries.	Wassermann Reaction.	Heart.	Urea Concentration Test.	cc. of urine passed in second hour.	Diastatic test.	Occupation, Ascribed cause and general remarks.
47	3 yr	Ep. Hy. Gr.	+	1018	+	-	120/80	+	N	A.B. 5th space N.L.	1.5	114	2	Clerk. Exposure. Renal efficiency poor.
48	4½ yr	-	-	1020	+	-	140/80	-	N	A.B. 5th space Int. N.L.	2.95	75	6.6	Traveller. Exposure. Renal efficiency good. Second aortic sound accentuated.
49	3 yr	-	+	1018	+ Pus	-	140/90	-	N	A.B. 5th space. Int. N.L.	2.5	82	2	Barber. No cause given. Renal efficiency good. Diuresis after urea. Test repeated. Renal calculus present.
50	12 yr	-	-	1012	-	-	110/60	-	N	A.B. 4th space Int. N.L.	2.3	58	2	Labourer. No cause given. Renal efficiency good.
51	2 yr	-	-	1012	-	-	110/60	-	N	A.B. 5th space 3½" M.S.B.	2.8	100	2	Labourer. Exposure. Renal efficiency good. Tubercle bacilli found in sputum.
52	2 yr	-	-	1022	+	-	158/92	-	P	A.B. 5th space. Int. N.L.	2.15	114	3.3	Miner. No cause given. Renal efficiency good.
53	3 yr	-	-	1022	-	-	130/85	+	N	A.B. 5th space Int. N.L.	2.8	60	3.3	Linoleum Worker. Exposure. Renal efficiency good.
54	1 yr	Hy. gr.	++	1008	+++ Pus	+++	140/80	-	N	A.B. 5th space Int. N.L.	1.8	102	2	Labourer. Exposure. Renal efficiency poor. Marked diuresis after urea. Test repeated.
55	4 yr	-	-	1024	- Pus	-	128/79	-	N	A.B. 5th space Int. N.L.	2.6	95	10	Plasterer. Exposure. Renal efficiency good.
56	5 yr	-	-	1008	+	-	136/96	+	N	A.B. 5th space Int. N.L.	1.8	110	2	Farm-hand. No cause given. Renal efficiency poor.

No. of Case.	Service.	Casts.	Red Blood Cells.	Specific Gravity.	Albumin.	Oedema.	Blood Pressure.	Arteries.	Wassermann Reaction.	Heart.	Urea Concentration Test.	cc. of urine passed in second hour.	Diastatic test.	Occupation, ascribed cause and general remarks.
57	4 yr	-	-	1020	-	-	165/80	+	N	A.B. 5th space Int. N.L.	2.15	65	20	Regular soldier. Exposure. Renal efficiency good.
58	6 yr	Gr. Hy.	+	1012	++	-	140/85	-	N	A.B. 5th space Int. N.L.	1.1	130	6.6	Commercial Traveller - ex regular soldier. No cause given, but developed Nephritis in hospital following Tonsillitis, specially discussed.
59	5 yr	Hy.	-	1016	-	-	125/75	-	N	A.B. 5th space Int. N.L.	2.85	96	3.3	Carter. No cause given. Renal efficiency good.
60	2 yr	-	-	1014	+ Pus	-	130/79	-	N	A.B. 5th space Int. N.L.	3.4	100	6.6	Nurse. No cause given. Renal efficiency good. Right kidney removed for Tuberculous disease some years ago.
61	4 yr	-	-	1024	-	-	115/85	+	N	A.B. 5th space Int. N.L.	4.7	44	10	Iron trimmer. No cause given. Renal efficiency good.
62	$3\frac{4}{12}$ yr	Hy. Gr.	-	1012	+ Trace	-	120/80	-	N	A.B. 5th space Int. N.L.	3.4	46	66	Clergyman. Exposure. Renal efficiency good. Viceroptosis and Neurasthenia.
63	2 yr	Hy.	-	1028	+	-	120/80	+	N	A.B. 5th space Int. N.L.	2.8	70	6.6	Saw Miller. Exposure. Renal efficiency good. Debilitated.
64	3 yr	-	-	1034	+	-	125/85	-	N	A.B. 5th space. Int. N.L.	3.5	120	10	Tailor. No cause given. Renal efficiency good.
65	5 yr	-	-	1012	-	-	130/90	+	N	A.B. 5th space Int. N.L.	2.3	60	6.6	Miner. Injections given whilst prisoner of war. Renal efficiency good. Raynaud's disease.
66	3 yr	Hy	-	1012	+ Trace	-	110/70	-	N	A.B. 5th space Int. N.L.	2.3	75	2	Miner. No cause given. Renal efficiency good.

GROUP THREE.

No. of Case.	Service.	Casts.	Red Blood Cells.	Specific Gravity.	Albumin.	Oedema.	Blood Pressure.	Arteries.	Wassermann Reaction.	Heart.	Urea Concentration Test.	cc. of urine passed in second hour.	Diastatic test.	Occupation, ascribed cause and general remarks.
1	4 yr	-	-	1014	-	+	125/85	-	N	A.B. 6th space N.L.	2.3	80	6.6	Slater. Exposure. Renal efficiency good. All cardiac sounds accentuated.
2	2 yr	-	-	1018	+ trace	-	208/112	+++	P	A.B. 5th space. Int. N.L.	3.45	52	6.6	Slater. Exposure. Renal efficiency good. Arterio-sclerosis. Cardiac sounds accentuated.
3	1 yr	-	-	1022	+ trace	+	135/85	+	N	A.B. 5th space Int. N.L.	2.5	92	6.6	Miner No cause given. Renal efficiency good.
4	3 yr	Hy	-	1022	-	-	170/30	-	N	A.B. 5th space Int. N.L.	2.8	80	6.6	Clerk. Exposure. Renal efficiency good.
5	1 yr	Gr.	+	1014	+ trace	-	130/90	-	N	A.B. 5th space Int. N.L.	1.25	72	3.3	Mason. Exposure. Renal efficiency poor.
6	5 yr	-	-	1016	-	-	130/90	-	N	A.B. 5th space Int. N.L.	3.05	74	6.6	Shoemaker. Bronchitis. Renal efficiency good.
7	1 yr	-	+	1018	+ trace pus	-	140/80	+	N	A.B. 5th space Int. N.L.	1.45	36	10	Miner. Injury in explosion, resulting in rupture and removal of right kidney. Renal efficiency poor.
8	3 yr	-	-	1028	+++ Pus.	-	128/90	+	N	A.B. 5th space Int. N.L.	2.65	66	10	Farmer. No cause given. Renal efficiency good. Operation confirmed diagnosis of T.B. Kidney.
9	4 yr	Hy	+	1018	+	+	165/110	+	P	A.B. 5th space Int. N.L.	1.8	72	20	Miner. No cause given. Renal efficiency fair. Arterio-sclerosis.
10	3 yr	-	-	1012	+ trace pus	-	130/85	-	N	A.B. 5th space Int. N.L.	1.1	120	6.6	Shopkeeper. Injury whilst riding a horse. Renal efficiency poor. A case of chronic cystitis.

No. of Case.	Service.	Casts.	Red Blood Cells.	Specific Gravity.	Albumin.	Oedema.	Blood Pressure.	Arteries.	Wassermann Reaction.	Heart.	Urea Concentration Test.	cc. of urine passed in second hour.	Diastatic test.	Occupation, ascribed cause and general remarks.
11	15 yr	Hy. gr.	+	1008	+ Trace	+	225/160	++	N	A.B. 5th space N.L.	0.75	105	2	Grocer. No cause given. Renal efficiency bad. Diuresis after urea. Cardiac sounds accentuated.
12	2 yr	Hy. Gr.	+	1012	+ Pus	-	190/116	++	N	A.B. 5th space ½" Ext. N.L.	1.4	44	2	Shop-keeper. No cause given. Renal efficiency poor. Mitral Stenosis.
13	4 yr	-	-	1010	-	-	145/90	-	N	A.B. 5th space Int. N.L.	2.2	210	6.6	Fisherman. Influenza. Renal efficiency good. Marked diuresis after urea.
14	6/12 yr	-	+	1018	+	-	155/105	-	N	A.B. 6th space N.L.	1.8	150	6.6	Salesman. No cause given. Renal efficiency fair. Diuresis after Urea. Mitral Stenosis and Auricular Fibrillation.
15	4 yr	-	-	1022	-	-	110/80	-	N	A.B. 5th space Int. N.L.	3.3	45	6.6	Fisherman. Immersion in water. Renal efficiency good. Fibrosis of both lungs.
16	2 yr	Hy.	+++	1018	+	-	118/80	-	N	A.B. 5th space Int. N.L.	2.5	150	10	Miner. Exposure. Renal efficiency good. Diuresis after Urea.
17	6 yr	-	+++	1012	+++ Pus	+	170/90	++	P	A.B. 6th space N.L.	0.8	100	3.3	Electrical Engineer. Rheumatism. Renal efficiency bad. Discussed later.
18	4 yr	Hy. Ep.	-	1008	++ Pus	-	240/90	-	N	A.B. 5th space Int. N.L.	1.7	60	6.6	Fisherman. No cause given. Renal efficiency fair.
19	5 yr	-	-	1014	+++ Pus	-	120/70	+	P	A.B. 5th space Int. N.L.	1.8	80	3.3	Miner. Exposure. Renal efficiency fair.
20	3 yr	-	-	1018	+	-	115/70	-	N	A.B. 5th space Int. N.L.	1.6	75	6.6	Millhand. Cycle accident resulting in removal of right kidney. Renal efficiency fair. Brain Tumour.

No. of Case.	Service.	Casts.	Red Blood Cells.	Specific Gravity.	Albumin.	Oedema.	Blood Pressure.	Arteries.	Wassermann Reaction.	Heart.	Urea Concentration Test.	cc. of urine passed in second hour.	Diastatic test.	Occupation, ascribed cause and general remarks.
21	15 yr	-	-	1014	+ Pus	+	126/80	-	N	A.B. 5th space N.L.	2.35	120	6.6	School Janitor. No cause given. Renal efficiency good. Urethral stricture present.
22	30 yr	-	-	1008	+ Trace	++	182/122	+	N	A.B. 6th space 1" Ext. N.L.	1.6	100	3	Regular Soldier. Exposure. Renal efficiency fair. Cardiac Hypertrophy with Mitral Incompetence.
23	3 yr	-	+	1018	+	-	165/110	+	N	A.B. 5th space Int. N.L.	3.4	104	6.6	Miner. Exposure. Renal efficiency good. Arterio-sclerosis. Aortic Aneurysm.
24	11 yr.	Hy. gr.	+	1012	+++	++	152/84	+	N	A.B. 5th space N.L.	1.0	120	3	Clerk. Exposure. Renal efficiency poor.
25	4 yr	Hy.	-	1020	+ Pus	-	130/80	-	N	A.B. 5th space Int. N.L.	2.3	74	10	Carter. Malaria. Renal efficiency good. Renal calculus confirmed by operation.
26	3 yr	-	-	1012	-	-	160/100	-	N	A.B. 5th space Int. N.L.	3.13	102	6.6	Farm-hand. Exposure. Renal efficiency good.
27	4 yr	-	-	1010	+ Pus	-	180/100	-	N	A.B. 5th space ¼" Ext. N.L.	0.9	80	3	Labourer. No cause given. Renal efficiency bad.
28	2 yr	-	-	1018	-	-	125/85	-	N	A.B. 5th space N.L.	4.0	85	10	Labourer. Bronchitis. Renal efficiency good.
29	2 yr	Hy.	-	1018	+	-	152/84	-	N	A.B. 5th space N.L.	2.0	84	6.6	Crofter. Exposure. Renal efficiency good.
30	3 yr	Hy.	-	1026	-	-	154/97	-	N	A.B. 5th space Int. N.L.	3.6	75	6.6	Miner. Exposure. Renal efficiency good.

No. of Case.	Service.	Casts.	Red Blood Cells.	Specific Gravity.	Albumin.	Oedema.	Blood Pressure.	Arteries.	Wassermann Reaction.	Heart.	Urea Concentration Test.	cc. of urine passed in second hour.	Diastatic test.	Occupation, ascribed cause and general remarks.
31	5 yr	Hy. gr.	-	1016	-	-	115/78	-	N	A.B. 5th space Int. N.L.	1.7	110	10	Clerk. Malaria. Renal efficiency fair.
32	12 yr	Hy. gr.	-	1020	+	+	137/96	-	N	A.B. 5th space Int. N.L.	1.35	120	3.3	Miner. Chill. Renal efficiency poor.
33	2 yr	-	+	1012	+	-	156/60	+	N	A.B. 6th space N.L.	1.4	100	2	Shop-keeper. No cause given. Renal efficiency poor. Aortic Incompetence.
34	6/12 yr	-	-	1016	+	-	120/80	-	N	A.B. 5th space Int. N.L.	2.4	110	6.6	Constructional Iron Worker. No cause given. Renal efficiency good.
35	1 yr.	-	-	1030	-	-	130/90	+	N	A.B. 5th space N.L.	3.35	82	6.6	Miner. Exposure. Renal efficiency good.
36	4 yr	Hy. Ep.	-	1012	+ Pus	-	185/110	+	N	A.B. 5th space Int. N.L.	1.4	62	2	Watchman. Bronchitis. Renal efficiency poor. Diuresis after Urea.
37	2 yr	-	-	1012	-	-	130/90	-	P	A.B. 5th space Int. N.L.	2.15	80	2	Miner. No cause given. Renal efficiency good.
38	2 yr	Hy. gr.	-	1018	+	-	138/95	++	N	A.B. 5th space Int. N.L.	2.2	90	3.3	Miner. Exposure. Renal efficiency good. Test repeated on account of diuresis.
39	4 yr	-	+	1014	+	-	170/65	+	P	A.B. 5th space Int. N.L.	1.95	60	2	Fire hose Weaver. Exposure. Renal efficiency fair.
40	2 yr	-	-	1022	+	-	158/92	-	P.	A.B. 5th space Int. N.L.	2.3	86	10	Miner. Exposure. Renal efficiency good.
41	3 yr	-	-	1020	-	-	138/92	-	N	A.B. 5th space Int. N.L.	1.65	110	6.6	Caretaker. No cause given. Renal efficiency fair.

No. of Case.	Service.	Casts.	Red Blood Cells.	Specific Gravity. *	Albumin.	Oedema.	Blood Pressure.	Arteries.	Wassermann Reaction.	Heart.	Urea Concentration Test.	cc. of urine passed in second hour.	Diastatic test.	Occupation, ascribed cause and general remarks.
42	5 yr	-	+++	1010	++	++	220/98	++	N	A.B. 5th space Ext. N.L.	0.95	95	2	Shipyard Worker. Exposure. Renal efficiency bad. Diuresis with urea.
43	20 yr	-	-	1024	+ Pus	-	120/80	-	N	A.B. 5th space Int. N.L.	2.8	60	10	Soldier. No cause given. Renal efficiency good. Pulmonary Tuberculosis.
44	2 yr	-	-	1022	+ Trace	+	210/110	+	N	A.B. 5th space N.L.	2.9	44	10	Commercial Traveller. Exposure. Renal efficiency good. Arterio-sclerosis. Cardiac sounds accentuated.
45	3 yr	Hy. gr.	+	1018	+	-	130/80	+	N	A.B. 6th space Int. N.L.	1.7	85	2	Clerk. Exposure. Renal efficiency fair.
46	14 yr	-	+	1022	++	-	165/90	+	N	A.B. 5th Space. Int. N.L.	2.25	72	6.6	Hawker. Exposure. Renal efficiency good. Fibrosis of both lungs.
47	2 yr	-	-	1018	-	-	135/90	-	N	A.B. 5th space Int. N.L.	1.75	146	6.6	Postmaster. Exposure. Renal efficiency good. Marked diuresis after urea. Case of Visceroptosis and Pulmonary Tuberculosis.
48	4 yr	-	+	1006	+ Pus	+	178/120	++	N	A.B. 5th space Ext. N.L.	0.75	76	2	Carrier. Exposure. Renal efficiency bad. Mitral Incompetence and right hemiplegia. Died.
49	18 yr	-	-	1022	+	+++	110/90	-	N	A.B. 5th space. Int. N.L.	2.85	62	10	Carter. Exposure. Renal efficiency good. Chronic Bronchitis.

No. of Case.	Service.	Casts.	Red Blood Cells.	Specific Gravity.	Albumin.	Oedema.	Blood Pressure.	Arteries.	Wassermann Reaction.	Heart.	Urea Concentration Test.	cc. of urine passed in second hour.	Diastatic test.	Occupation, ascribed cause and general remarks.
50	5 yr	-	++	1012	+ Pus	-	155/85	+	N	A.B. 5th space Int. N.L.	1.6	104	10	Engineer. No cause given. Renal efficiency poor.
51	5 yr	-	-	1008	++ Pus	-	135/87	-	N	A.B. 5th space Int. N.L.	0.85	94	3.3	Nurse. No cause given. Renal efficiency bad. Considered to be a case of Tuberculous kidney.
52	4 yr	-	-	1022	+ Trace	-	145/85	-	N	A.B. 5th space Int. N.L.	2.6	46	6.6	Shopkeeper. Exposure. Renal efficiency good.
53	4 yr	-	-	1018	-	-	125/85	+	N	A.B. 5th space N.L.	3.4	90	6.6	Joiner. Bronchitis. Renal efficiency good.
54	5 yr	-	+	1014	+ Pus	-	165/110	-	N	A.B. 5th space Int. N.L.	2.4	134	6.6	Clerk. No cause given. Renal efficiency good.
55	1 yr	-	-	1008	+	-	145/115	-	N	A.B. 5th space N.L.	3.6	75	10	Nurse. No cause given. Renal efficiency good.
56	4 yr	-	-	1006	+ Trace	-	135/98	-	N	A.B. 5th space Int. N.L.	2.3	60	6.6	Labourer. Exposure. Renal efficiency good.

GROUP FOUR.

No. of Case.	Service.	Casts.	Red Blood Cells.	Specific Gravity.	Albumin.	Oedema.	Blood Pressure.	Arteries.	Wassermann Reaction.	Heart.	Urea Concentration Test.	cc. of urine passed in second hour.	Diastatic test.	Occupation, ascribed cause and general remarks.
1	5	-	-	1010	+ Pus	+	154/96	-	N	A.B. 5th space Int. N.L.	2.1	65	6.6	Miner. Rheumatism. Renal efficiency good.
2	1	Hy. Gr.	+	1010	+	+	200/110	++	N	A.B. 5th space N.L. Sounds accentuated.	1.1	80	3.3	Labourer. Bronchitis. Renal efficiency poor. Auricular fibrillation.
3	20	-	-	1014	+	-	162/110	+++	N	A.B. 5th space N.L.	1.7	90	6.6	Mason. No cause given. Renal efficiency fair. Arterio-sclerosis.
4	4	Hy.	-	1022	++ Pus	+	230/130	++	N	A.B. 5th space Ext. N.L.	2.5	75	3	Labourer. Bronchitis. Renal efficiency good. Arterio-sclerosis.
5	2	-	-	1022	+ Trace	-	130/86	-	N	A.B. 5th space Int. N.L.	2.7	48	3.3	Mason. No cause given. Renal efficiency good.
6	3	-	-	1020	-	-	140/90	-	N	A.B. 5th space Int. N.L.	3.6	47	6.6	Fisherman. No cause given. Renal efficiency good.
7	4	-	-	1024	++	-	135/87	+	N	A.B. 5th space Int. N.L.	2.5	48	20	Slater. No cause given. Renal efficiency good.
8	3	-	+	1022	+	+++	170/120	+	N	A.B. 5th space. Int. N.L.	1.8	75	3.3	Boot-finisher. No cause given. Renal efficiency poor.

No. of Case.	Service.	Casts.	Red Blood Cells.	Specific Gravity.	Albumin.	Oedema.	Blood Pressure.	Arteries.	Wassermann Reaction.	Heart.	Urea Concentration Test.	cc. of urine passed in second hour.	Diastatic test.	Occupation, ascribed cause and general remarks.
9	3	-	-	1002	-	+	158/90	+	N	A.B. 5th space Int. N.L.	1.6	84	2	Miner. Rheumatism. Renal efficiency fair.
10	2	-	-	1008	-	-	150/90	+	N	A.B. 5th space Int. N.L.	2.0	100	2	Tailor's Cutter. Bronchitis. Renal efficiency good. Diuresis - Test repeated.
11	5	Hy. Gr.	+	1018	+ Trace	-	150/90	-	N	A.B. 5th space. Int. N.L.	1.5	50	2	Timber yard Worker. No cause given. Renal efficiency poor.
12	20	-	+	1008	+++	+	200/165	++	N	A.B. 6th space N.L.	1.5	60	2	Electric Car Driver. No cause given. Renal efficiency poor.
13	44	-	-	1012	+ Trace	-	164/94	+	N	A.B. 5th space Int. N.L.	1.6	85	2	Regular Soldier. Cold and exposure. Renal efficiency fair. Mitral Incompetence.
14	2	-	-	1018	-	-	142/58	+	P	A.B. 6th space Ext. N.L.	0.5	244	3.3	Labourer. No cause given. Renal efficiency poor. Marked diuresis. Mitral Incompetence.
15	2	-	-	1014	-	-	160/9	++	P	A.B. 5th space Int. N.L.	2.5	80	2	Sawmill Worker. No cause given. Renal efficiency good. Arterio-sclerosis.
16	1	Hy. gr.	+	1016	++	++	210/120	++	N	A.B. 5th space N.L.	0.7	196	3.3	Porter. Dysentery. Renal efficiency bad. Arterio-sclerosis.

4. ETIOLOGY.

On studying the cases the first point of interest is centred around a possible solution of the etiology of this disease. With this object in view the cases were carefully scrutinised in regard to:-

I. Their age.

II. Previous occupation.

III. Length of service.

IV. Previous attacks of nephritis.

V. Their own statements as to cause. e.g. exposure.

VI. Other possible factors.

(a) infection, e.g. spread by parasites.

(b) water supply.

(c) diet and alcohol.

(d) syphilis.

(e) parasites.

Age was the first factor to be considered and it will be seen that the first three decennial groups are composed of approximately equal numbers, whilst the fourth containing patients aged fifty-one years and upwards is very much less. In a further table, appended below, it is shown that the majority of cases are aged between twenty-seven years and forty-five years, and that they are very evenly distributed between the intervening years. Since the largest number of/

of people mobilised during the late war were between these ages it is not surprising to find a correspondingly large number of cases during this period.
It is therefore considered that age plays no etiological part in this disease.

TABLE OF AGES.

Years of age.	No. of Cases.	Years of age.	No. of Cases.	Years of age.	No. of Cases.
21	1	31	4	41	5
22	2	32	8	42	9
23	4	33	5	43	5
24	4	34	8	44	6
25	11	35	5	45	5
26	3	36	8	46	3
27	10	37	9	47	6
28	12	38	6	48	7
29	6	39	4	49	3
30	9	40	9	50 and over.	23

Secondly the previous occupation of these patients was investigated and each of the two hundred cases under consideration was carefully interrogated as to his previous occupation. The highest incidence was found in the case of miners, labourers and to a less extent/

extent in fishermen, but this was only in accordance with the fact that the proportion of patients drawn from areas where these occupations were prevalent was great. In the case of plumbers and printers - trades in which the presence of lead might exert a detrimental influence on the kidney - the incidence in the present series amounts to one plumber and two printers. Indeed the variety of previous occupations given was so great that the condition appeared to attack members of any occupation and therefore it is considered that the previous occupation plays no part in the etiology of this disease. Appended is a table giving the previous occupations of all the cases now under review.

TABLE OF OCCUPATIONS.

Asylum Attendant	1	Electric Car driver	1
Barber	1	Fire Hose Weaver	1
Boot finisher	1	Farmer	3
Commercial Traveller	3	Farm hand	6
Crofter	3	Fireman	1
Chemist	1	Fisherman	12
Clerk	9	Gardener	2
Clergyman	1	Groom	1
Carter	5	Hawker	1
Distillery Worker	2	Iron Trimmer	2
Engineer	3	Joiner	2

Labourer	27	Roadman	2
Linoleum Worker	1	Railway Engine Cleaner	1
Mason	3	Rabbit Catcher	1
Mill Worker	2	Set maker	1
Motor mechanic	3	Sail maker	1
Miner	39	Shop keeper	9
None	5	Soldier	6
Nurse	3	Slater	3
Postmaster	1	School Janitor	3
Plasterer	1	Shoe maker	1
Plate layer	1	Shipyard worker	2
Ploughman	1	Student	2
Printer	2	Timber Yard Worker	1
Plumber	1	Tailor	2
Poultry farmer	2	Watchman	1
Porter	4	Worker Jute	1
Rubber Worker	3	Saw Mill Worker	2

Length of Service with the colours does not appear to play any part in the cause of this disease. The periods given in the following table are based upon the date of enlistment and the date of discharge from the service. It will be readily observed that the length of service is very evenly distributed over periods of two, three and four years. This result is what one would ordinarily expect when it is remembered that so many people were enlisted for the duration of the war and had experienced no previous military training. Only sixteen patients out of the two hundred/

hundred examined had served with the colours for a period of ten years or over. Thus the conclusion arrived at from a study of the length of service is that it does not in any way predispose to the development of nephritis.

TABLE SHOWING LENGTH OF SERVICE.

One year or less	22	Six years	5
Two years	50	Seven "	2
Three "	45	Eight "	0
Four "	40	Nine "	0
Five "	20	Ten years and over	16

It has been suggested that the existence of a previous attack would render a patient more likely to re-contract this disease. This has not been upheld by examination of the present series. In these cases only one gave a history of a previous attack of nephritis. This attack had occurred twelve years previously and the patient stated that he had recovered completely from this. This acknowledgment was obtained in case number sixteen, group four. As this was the only instance in which this was obtained, the presence of previous nephritis cannot be regarded as a causal factor. The relation of the condition to pre-existing albuminuria has been fully investigated by Macleod and Ameuille[24] who failed to find/

find any evidence that nephritis was more prevalent in these patients than in others. These findings were in complete agreement with those of Maclean[25] who carried out investigations upon large numbers of recruits and was in many instances able to follow the medical history of these cases. He reported an incidence of five per cent of men joining the army to have albuminuria with no obvious reason for this condition.

An examination of the table of causes, as stated by the patient, given below, is interesting in so far as that it shows that eighty-eight out of the two hundred patients ascribe the cause of their condition to exposure. Many other observers have expressed opinions upon the possibility of exposure being a causal factor and the general trend of opinion seems to be against exposure being a cause of this disease. Abercrombie[26] in an article "Acute Renal disease amongst troops in France" stated that he did not consider exposure as a cause since he saw no cases during the months of January and February when the climatic conditions were severe, whereas later on in the warmer weather he encountered frequent cases. Similar observations were made by Raw[27]. Langdon Brown[28] stated that he had only found a history of wetting and exposure in twenty-two patients out of a hundred and sixteen examined, the remainder giving no history of exposure whatsoever. He further stated exposure could not/

not be held to be of etiological importance, since there were few cases during the worst weather and that there was an increase in the number of cases in Spring when the violent fluctuations of temperature were past. Further he remarked upon the scarcity of this condition during the South African War, the Russo-Japanese war and the operations at Suvla Bay. In a further series of fifty-eight patients Langdon Brown[29] obtained a history of exposure in twenty instances. The view that exposure and severity of climatic conditions had no effect upon the number of cases reported is also supported by Shaw Dunn and McNee[30].

Bruns[31] on the other hand is reported to have obtained a history of exposure in seventy per cent out of two hundred cases examined. This will be seen to be considerably higher than the percentage found in the present series. Sir Thomas Oliver[32] points out that this condition was found to occur with great frequency amongst the German soldiers when they had to sleep on the bare pavement without a covering of straw, a condition which is reported to have ceased when the soldiers slept on wood. He further points out that the incidence of nephritis increased in the Italian army when, during the month of May, one blanket was withdrawn, and its disappearance on the restoration of the blanket and distribution of warmer clothing. Whilst the weight of evidence is against exposure being/

being a causal factor it is very difficult for one who has seen the soldiers in cold, damp and snowy weather lying in their wet clothes to exclude altogether exposure to wet and cold as a direct or indirect cause of this malady. It is probably a condition which though not a causal one is one which predisposes towards this disease.

Sixty-eight patients were unable to attribute their malady to any definite cause, whilst of the remainder nine gave bronchitis as the cause, eight rheumatism, five each to chill and to malaria, four to injury and the remainder to different diseases as shown in the table below.

TABLE OF STATED CAUSE.

Exposure	88	Typhoid Fever	2
Malaria	5	Wet	1
Influenza	3	Tonsillitis	1
Chill	5	Lead smelting whilst Prisoner of War	1
Injury	4	Injections given by German doctor whilst a prisoner	1
Rheumatism	8	Immersion in water	1
Trench Fever ...	1	Dysentery	2
Bronchitis 9		Unknown	68

It is difficult to attribute nephritis to any of these conditions but it is interesting to compare the findings of other observers with the above table.

Muir[33]/

Muir[33] quotes Rose Bradford as reporting a history of bronchitis in thirty per cent of a series of cases examined by him. In the same article Abercrombie is stated to have found bronchitis associated with this disease so often that he was doubtful whether he should regard it as a complication or a phenomena of the disease. The findings of the above observers with regard to bronchitis are not accepted as being the cause, in any way, of nephritis. The seasonal incidence of bronchitis did not harmonise with that of nephritis, neither does the low percentage of four and a half per cent found in the present series suggest this malady as being a likely cause of the condition under consideration.

The number of patients giving rheumatism as the cause is represented by the low percentage of four. Only one patient attributed his condition to tonsillitis and this case is very similar to one reported by Clarke[34] in so far as that in both instances these patients were admitted to hospital with follicular tonsillitis and it was not until they had been in hospital for some days that the condition of nephritis developed. The important difference between the cases lies in the fact that the patient in this series survived whilst the patient of Clarke did not. In both instances there is conclusive evidence that follicular tonsillitis was the direct cause of the nephritis. It is well known that nephritis often occurs/

occurs as a complication of many diseases, both mild and severe, and Coombes[35] comments upon the frequent connection of the onset with some infective disease. This has not been borne out by the present investigations which only give an infective history in eight per cent, which finding more nearly corresponds with the percentage given by Bradford[36] in a series of cases investigated by him. This percentage is probably no larger than would have been obtained in any series of patients suffering from other diseases and this theory cannot be entertained as that presenting the solution to the most common cause of this disease.

Syphilis has not remained free from suspicion and although the results of different observers vary considerably, the idea of its being a causative factor has been definitely dismissed. In the present series a positive Wassermann reaction was obtained in twenty instances. This, a percentage of ten, is not considered to be in excess of that which would be found if the percentage were taken in any other malady. That the percentage is subject to variation has been found by a comparison with the findings of other observers. Wilson[37] failed to obtain a positive result in a series of ninety cases. Langdon Brown[38] examined fifty-eight patients and obtained a positive reaction in eighteen instances. Another observer, namely Mackenzie Wallis[39], reported a positive finding in/

in eighteen cases out of twenty-six examined. Ameuille[40] is quoted to have been found no difference, in the French army, between nephritic patients and other patients examined, as regards the frequency of a positive result. Syphilis, therefore, is not regarded as a causal condition of nephritis.

The water supply was excluded as a causal factor by the findings of the Base Hygiene Laboratory[41] which examined samples of water from various areas and in every instance found it free from lead, arsenic and copper. Traces of zinc were sometimes found, probably derived from the galvanised tanks and pipes through which the water had passed. After the opening months of the war were over most of the water was subjected to hyperchlorination and there are those[42] [43] who regard this as a cause of the malady. Such, however, would not appear to fall in with the facts as nephritis occurred in areas where chlorination of the water was not practised, and again no nephritis was reported in some areas where the water had been chlorinated. It is probable, also, that all traces of chlorine had disappeared from the water before it was used. It is improbable therefore that chlorination plays any part in the cause of this disease. This is in agreement with the views expressed by Macleod and Ameuille[44]. In the same article Macleod and Ameuille advanced the theory that faulty diet was a causative factor. They contended that an excess of protein diet together with

a/

a deficient vegetable diet was responsible for a scorbutic and fragile condition of the kidneys with albuminuria and that this albuminuria went on to the more serious condition of nephritis.

They pointed out that the excretion of urea in healthy British soldiers was higher than in the case of the French, and also that nephritis appeared later and was less severe in the French than in the British armies. It is quite reasonable to admit that an excess of protein might make the kidneys less resistant to any superadded toxic or infectious condition, but it has been pointed out by the Medical Research Committee[45] that officers had as much protein in their diet as the men, yet the percentage of cases amongst the officers was less than that amongst the men. Dyke[46] also attributed the condition to dietetic errors and ascribed the condition to lack of vegetables. Against this last opinion is that of Chandler[47] who states that there was an abundant supply of fresh vegetables for the troops on a certain part of the line during 1915, and that there was in this area at this time a large incidence of cases. Many German writers have been quoted[48] as stating this condition to be dietetic in origin, but these ideas are not held now, since the incidence of this malady was never found to vary with the food and in many instances it occurred under conditions where the food was normal in quantity and quality.

It/

It is probable that alcohol would aggravate an already embarrassed kidney, but this cannot be regarded as a cause - especially when the condition occurred in many patients who had been total abstainers.

Macleod and Ameuille, in the article already quoted, stated that the incidence of disease was no higher in cases with a previous history of albuminuria than among those with healthy urine. This view is in complete accordance with the findings of Maclean[49]. It is not considered that pre-existing albuminuria is a predisposing cause of this disease.

Since the etiology of this malady could not be ascribed satisfactorily to any of the causes already discussed, and that the progress of disease remained unchecked the trend of opinion verged towards the condition being due to some infection. This view received the support of Abercrombie, Langdon Brown, Pick, Raw and others. Abercrombie[50] based his theory upon his clinical findings, and upon the character of the epidemics. He found that the condition was chiefly prevalent in certain areas and the condition occurred chiefly in the front line and was characterised by small epidemics. Langdon Brown[51] stated that his opinion regarding the condition being of infective origin was based upon the presence of fever at the outset and the relapses. Shaw Dunn[52] pointed out the comparative immunity of the civilian population even though the latter were in close contact with

affected/

affected troops. Thus he pointed out that if the condition were infective in origin it must be carried in some manner peculiar to the troops. The conditions being probably spread by lice since it was noted that the greatest incidence of this disease occurred in the fighting zone and that very few cases originated at the base. In this connection it is interesting to note that a unit with a high incidence of nephritis in the front line continued to return a high incidence for some time after returning to the rest billet. Further it was reported that a new division taking over the new area was liable to return many cases of nephritis. Whilst it must be confessed that the exact cause and spread of the condition of war nephritis remains unsolved, the probability exists that the condition was due to a louse borne infection and that exposure was a predisposing cause.

A Summary on the etiological factors under discussion. Special reference to the etiology of actual nephritis cases will be made later (p. 112).

1. Age did not appear to be an etiological factor.

2. Previous occupation did not appear to be a predisposing cause.

3. Length of service with the colours was not a cause.

4. Previous attacks of nephritis did appear to be a predisposing factor.

5. Exposure, which was a given cause in 44% of all cases examined. It is not a cause but may be a predisposing condition.

6. The water supply. There is not sufficient evidence to regard hyperchlorination of the water as an etiological factor.

7. Diet and alcohol played no part.

8. Syphilis. A positive Wassermann reaction was obtained with the blood serum in 10% of all patients, with a greater incidence in the last three groups. The nephritis cases in which it occurred were not of greater severity than those in which it did not. It is not regarded as being of etiological significance.

9. Theories have been advanced that the condition was spread by lice, but there is not sufficient data forward for these theories to be upheld.

5. DISCUSSION ON CASES.

The review of the results of the clinical examinations and urea concentration tests carried out upon these two hundred patients admitted to Craigleith Hospital for investigation into their renal condition showed that the existing disability varied from nil to one of marked severity.

In twenty-three patients there was no evidence of any form of disease, the patients being apparently quite healthy, the pre-existing nephritis having passed away without leaving any impairment of renal function. In eighty-one cases, or 40.5% of the total number examined, there was evidence of nephritis in varying degree. In many of these cases a grave prognosis was made, based upon the clinical examination and the low urea concentration present. All cases with a urea concentration of less than one per cent will be discussed in a separate group later on.

The majority of cases of actual nephritis were found to vary in degree from slight to that of moderate severity. Cases regarded as slight were those which had slight haematuria, albuminuria and casts in the urine, without the presence of oedema, cardio-vascular disease, and with a satisfactory renal efficiency. Cases illustrative of this group are numbers/

numbers 3, 10, and 21 of group I. Cases of moderate severity are those which showed haematuria, albuminuria, casts in the urine, in some instances slight oedema, and slight impairment of renal efficiency. Cases illustrative of this type are numbers 11, 16, and 54 of group II. The very severe cases are those which show haematuria, albuminuria, casts in the urine, oedema, cardio-vascular changes with raised blood pressure and impaired renal efficiency.
Cases illustrative of this type have been arranged in the following groups.

Cases with a urea concentration of less than 1% illustrative of severe nephritis.

This group contains seventeen patients in some of which the nephritis is associated with cardio-vascular disease. In each case the prognosis given was grave and that this was fully justified was shown in respect of five patients who died whilst still in hospital. These cases are tabulated here:-

GROUP OF CASES HAVING A UREA CONCENTRATION OF LESS THAN ONE PER CENT.

No. & Group of Case	Service.	Casts.	Red Blood Cells.	Specific Gravity.	Albumin.	Oedema.	Blood Pressure.	Arteries.	Wassermann Reaction.	Heart.	Urea Concentration Test.	cc. of urine passed in second hour.	Diastatic test.	Remarks.
Group I Case 16	4 yr.	-	-	1006	+	+	158/100	+	N.	A.B. 5th Space. Int. N.L.	0.56	60	2	No previous occupation. Died in hospital.
Group I. Case 25.	1 yr.	Hy. Gr.	-	1012	+	-	215/65	-	N.	A.B. 6th Space. 4½" M.S.L.	0.56	84	3.3	Engineer. Renal Efficiency bad. Double mitral and aortic lesions with cardiac hypertrophy. Discharged.
Group I. Case 28.	2 yr.	Hy. Ep.	-	1008	++ Pus	+++	175/115	+	N.	A.B. 5th Space. N.L.	0.616	65	2	No previous occupation. Died in hospital.
Group I. Case 50.	5 yr.	Hy gr Gr.	-	1006	+++	+	100/72	-	N.	A.B. 5th space. Int. N.L.	0.5	106	2	No previous occupation - old standing suppuration of hip. Died in hospital.
Group I. Case 53.	2 yr.	Waxy.	++	1012	+++ Pus	++	170/110	+	N.	A.B. 5th Space. Int. N.L.	0.85	55	2	No previous occupation. Died in hospital.
Group I. Case 55.	3 yr.	Hy. Gr.	-	1010	++	+	145/90	-	P.	A.B. 5th Space. Int. N.L.	0.75	178	2	Railway Engine Cleaner. Diuresis after urea. Discharged.
Group II. Case 19	12 yr.	Gr.	-	1018	+ Pus	+	150/100	++	N.	A.B. 5th Space. N.L.	0.95	100	3	Labourer. Discharged.
Group II. Case 23.	3 yr.	Hy. Hy gr	+	1008	++	+	126/96	-	N.	A.B. 5th Space. N.L.	0.75	92	3.3	Labourer. Discharged.
Group II. Case 45	1 yr.	Hy. gr.	+	1014	+++	+++	138/80	+	N.	A.B. 5th Space. Int. N.L.	0.75	108	3.3	Letter-press printer. Discharged.
Group III Case 2.	15 yr	Hg. gr.	+	1018	+	+	225/160	++	N.	A.B. 5th Space N.L.	0.75	105	3	Grocer. Diuresis after urea. Test repeated. Discharged.
Group III Case 17.	6 yr	-	+++	1912	+++ Pus	+	170/90	++	P.	A.B. 6th Space. N.L.	0.8	100	3.3	Electrical Engineer. Discharged.

No. & Group of Case.	Service.	Casts.	Red Blood Cells.	Specific Gravity.	Albumin.	Oedema.	Blood Pressure.	Arteries.	Wassermann Reaction.	Heart.	Urea Concentration Test.	cc. of urine passed in second hour.	Diastatic test.	Remarks.
Group III Case 27	4 yr	-	+ at times	1010	+ Pus	-	180/100	-	N	A.B. 5th Space. N.L.	0.9	80	3	Labourer. Discharged.
Group III Case 42	5 yr	-	+++	1010	++	++	220/98	++	N	A.B. 5th Space Ext. N.L.	0.95	95	2	Ship-yard worker. Diuresis after Urea Test repeated. Discharged.
Group III Case 48	4 yr	-	+	1006	+ Pus	++	178/120	++	N	A.B. 5th Space. Ext. N.L.	0.75	76	2	Carrier. Died.
Group III Case 51	5 yr	-	-	1008	++ Pus	+	135/87	-	N	A.B. 5th Space. Ext. N.L.	0.85	94	3.3	Nurse. Discharged. Condition diagnosed as Tuberculosis of Kidney.
Group IV Case 14.	2 yr	-	-	1018	-	-	142/58	+	P	A.B. 6th Space. Ext. N.L.	0.5	244	3.3	Labourer. Discharged.
Group IV. Case 16.	1 yr	Hy. gr.	+	1016	++	++	210/120	++	N	A.B. 5th Space. N.L.	0.7	196	3.3	Porter. Discharged.

Case No.16, group I, no occupation, aged 23, admitted to hospital for observation regarding the condition of nephritis and incontinence of urine. He stated that the condition had been brought about fourteen years previously by an injury to the perineum whilst playing on the school playground. Since that injury he stated that he had always been troubled with incontinence of urine. The patient walked into hospital and by outward appearance he appeared to enjoy good health. Examination of the patient revealed no evidence of disease in respect of heart, lungs, central nervous system or abdomen. There was slight thickening of the arteries and the systolic blood pressure was 158 mm. of Hg whilst the diastolic was 100 mm. of Hg. There was a fullness under the eyes but beyond this there was no sign of any oedema. There was no sign of any frequency of micturition, polyuria, or incontinence of urine. The urine contained pus cells, a small amount of albumin but no evidence of any casts or red blood cells. The diastatic value was 2 and the urea concentration equalled 0.56 per cent. The patient was allowed to be up and about in the ward.

On the fourth day after admission to hospital the patient conplained of headache, became drowsy and vomited. He was at once confined to bed. It was now noticed/

noticed that there was complete anuria and clinical examination of the abdomen revealed a greatly distended bladder. A catheter was passed and a large quantity of milky coloured urine was withdrawn. The patient became more drowsy and died after being in hospital for eight days. At the post-mortem examination the heart, lungs, liver and spleen appeared healthy. The bladder was greatly dilated and when stretched reached almost to the umbilicus. The mucous membrane of the bladder showed many haemorrhagic spots and was markedly necrosed. There was no evidence of any urethral stricture nor any evidence of prostatic enlargement. The left kidney showed advanced hydronephrosis with dilatation of calyces which contained a quantity of pus. No secreting tissue remained. This kidney weighed 2 ozs, as also did the right. The right kidney also showed advanced hydronephrosis and was in every respect similar to the left.

This patient must have been on the verge of death for some considerable time, yet beyond the extremely low urea concentration percentage there was nothing to show the gravity of his condition.

Case No.25, group I, an engineer, aged 23, was admitted to hospital as a case of nephritis and valvular disease of the heart. The patient stated that he had suffered/

suffered from rheumatic fever fifteen years previously and that his present complaints dated from 1915, when he was admitted to hospital in France suffering from nephritis. Upon admittance he complained of dyspnoea and cough, otherwise he was well nourished, had no oedema and presented no clinical signs of rheumatism. The lungs and central nervous system appeared healthy. The heart was hypertrophied, the right border of the heart being one and a half inches beyond the edge of the sternum and the apex beat was situated in the sixth interspace four and a half inches from the mid sternal line. There was also mitral stenosis and aortic incompetence. The systolic blood pressure was 215 mm. of Hg. and the diastolic pressure was 65 mm. of Hg. The Wassermann reaction on the blood serum was negative. There was no cyanosis and no oedema. The spleen and liver were not enlarged. The urine contained a trace of albumin, which disappeared before he was discharged from hospital, a few hyaline and granular casts were present but there was no evidence of any red blood cells. The urea concentration test was never more than 0.56 per cent and the diastatic value never higher than 3.3. The prognosis in this case was considered to be bad. He suffered from chronic interstitial nephritis which disease was aggravated by his cardiac condition.

Case No.28, Group I, an ex-Royal Naval Seaman, aged 22, was admitted to hospital during April 1921 diagnosed as chronic nephritis. He ascribed his condition to an attack of influenza and pneumonia which he had contracted in 1918. In 1919 he was demobilised on account of albuminuria and oedema of the lower extremities. At this period his heart and lungs were regarded as healthy, as shown by a record upon his medical history sheet. Upon admittance the heart, lungs and central nervous system were considered healthy. Beyond striae upon abdomen there was nil to note, the liver and spleen were not enlarged. There was slight accentuation of the second sound in the aortic area, the systolic blood pressure was 175 mm. of Hg. and the diastolic pressure 115 mm. of Hg. The Wassermann reaction on the blood serum was negative. Ophthalmic examination showed albuminuric retinitis with haemorrhages and opaque patches in both fundi. There was also a left sided otitis media with perforation. The urine contained a moderate amount of albumin, epithelial and hyaline casts, and a few red blood cells. The urea concentration equalled 0.616% and the diastatic value was 2. The oedema gradually subsided and the patient improved sufficiently to be allowed home after being in hospital for eleven weeks. The prognosis was regarded as bad.

Upon 6.3.22 he was readmitted to hospital with considerable/

considerable oedema of lower limbs. The cardiac condition was as before. There was now definite sclerosis of the arteries. The day after admittance he developed an acute attack of tonsillitis. He also complained of incontinence of urine. The prostate gland was considered normal, there was no evidence of stricture and only three ounces of urine were drawn off by catheter after the bladder had been voluntarily emptied.
On 6.5.22 the patient showed signs of pericarditis, the systolic blood pressure was now 194 mm. of Hg. and the diastolic 144 mm. of Hg.

On 22.5.24 the cardiac sounds were less loud than before, the aortic sounds were closed but a systolic murmur was heard in the mitral area. A blood culture at this time was negative. A blood count showed two and a half million red blood cells, a leucocytosis of 16 thousand with Hb.% of 52 and a colour index of 0.96.

On 30.5.24 extensive oedema of face, hands and lower limbs appeared. The cardiac sounds varied in intensity from day to day. The blood pressure was as noted on 6.5.22. Crepitations were now audible at the base of both lungs.

On 18.6.22. The cardiac sounds were still as noted. The patient became much more oedematous. Southey's tubes were inserted and drained freely.
On 27.6.22 the penis and scrotum became oedematous, the/

the Southey's tubes were still draining freely. Crepitations were now audible at the base of both lungs. On 4.7.22 there was still marked oedema; the patient also had a haemorrhage from a small ulcer under the prepuce. The condition gradually became worse and the patient died on 9.7.22.

At the post-mortem examination the abdomen was found to contain a large quantity of free fluid. The spleen, weighed five ounces, showed nothing to note. The liver weighed three pounds thirteen ounces and showed evidence of fatty degeneration. There was no abnormality of the bladder to note. The right kidney was small, weighed 4 ozs. and showed fatty degeneration with marked diminution of secreting substance. The capsule was adherent. The left kidney showed a condition similar to that found in the right. This kidney weighed $4\frac{1}{2}$ ozs. The left lung contained numerous calcareous nodules in the left apex. Both lungs were congested throughout.

The heart was enlarged and weighed $27\frac{1}{2}$ ozs. Adhesions were present between the parietal and visceral pericardium. The right side of the heart was dilated and the left side hypertrophied. All the valves were competent to the water test and, with the exception of the mitral valve on the under surface of which early vegetations were found, the valves appeared healthy.

Case No.50, Group I, of no occupation prior to enlistment, aged 25, admitted 25.1.24 for treatment of the condition of chronic nephritis. This patient received a gunshot wound of the left hip on 22.4.18; this wound became septic and continued to discharge for a long time. In April 1920 there was only a limited movement at the hip joint and the condition of albuminuria was noted, At this time there was also a discharging sinus in the region of the old gunshot wound. The patient was repeatedly in need of treatment for this discharging wound. On 11.9.22 there was still a large amount of albumin in the urine, the heart sounds were now accentuated in the aortic area, but there was no clinical evidence of cardiac enlargement. The hip continued to discharge until the latter part of 1923. Upon 25.1.24 the patient was admitted to Craigleith Hospital in order to receive treatment for the condition of nephritis. Upon examination he appeared to be thin and emaciated; he was also pale and anaemic.

There was no disease in respect of the lungs, abdomen and central nervous system. There was radiographic evidence of several small sequestra in the region of the old gunshot wound of hip but, at this time, no discharge. There was slight oedema of the feet and ankles. Beyond accentuation of the second sound in the aortic area, there was no evidence of disease/

disease in respect of the heart. The systolic blood pressure was 108 mm. of Hg. and the diastolic pressure 72 mm. of Hg. The urine was found to contain a large amount of albumin and hyaline and granular casts but no red blood cells. The urea concentration was less than 0.5 per cent and the diastolic value 2. The Wassermann reaction on the blood serum was negative. The result of a blood culture was also negative. There were two and a half million red blood cells per cmm., with a leucocytosis of over twelve thousand. The haemoglobin equalled 50 per cent. On 30.1.24 the urea concentration and diastatic tests were repeated but returned a similar result to that already given.

On 9.2.24 examination of the blood showed a decrease in the leucocytosis to eight thousand and also a slight increase in the red blood cells. The urea concentration and diastatic tests were as when previously carried out.

On 22.2.24 crepitations and an impaired note became audible at the bases of both lungs. On this day the patient appeared drowsy and vomited in the evening. On 27.2.24 he complained of pain in the kidney region, was still very drowsy and had three fits during the course of the day. He continued to have fits periodically until 29.2.24, upon which day he died from uraemia.

Post-mortem examination revealed no disease in respect/

respect of his heart. The bases of both lungs were oedematous and the pleura on the left side adhered to the ribs. The liver was not enlarged and showed slight waxy change. The spleen was small and showed nothing to note. There was nothing to note in the bladder. The abdomen contained no free fluid. Both kidneys showed advanced waxy degeneration. Each weighed 8 ozs. There was very little secreting tissue left and the capsules were non-adherent.

The microscopic appearances were as follows:-

1. Thickening of the capsules.
2. Extensive glomerular degenerative changes, many glomeruli being obliterated.
3. Areas showing much intertubular connective tissue.
4. Tubules in other areas much dilated and mostly containing Hyaline and Granular material.

Catarrhal changes in living epithelium.

In this patient the urea concentration test gave an early warning as to the gravity of the disease.

Case No. 53, Group I., of no occupation previous to enlistment, aged 25, was admitted to hospital on 29.2.24 with the diagnosis of chronic nephritis. Patient walked into hospital with marked dyspnoea and oedema of face and ankles. There was no evidence of disease in respect to lungs, abdomen and central nervous system. Beyond accentuation of the second sound/

sound in the aortic area there was nothing to note in respect to his heart. The arteries were palpable and the systolic blood pressure was 120 mm. of Hg. and the diastolic pressure 110 mm. of Hg. The patient appeared to be drowsy. The urine contained a large amount of albumin, red blood cells and a number of epithelial and of waxy casts. The urea concentration equalled 0.85 per cent and the diastolic value was 2. The prognosis was considered to be grave. The patient gradually became worse and died from uraemia on 9.3.24.

Post-mortem examination revealed no disease in respect of heart and lungs. Both the liver and spleen were large and congested. The kidneys were small, pale and showed waxy degeneration with loss of secreting tissue. In the right kidney a small abscess was found. The bladder was small, contained some pus cells, and showed early evidence of cystitis.

Case No. 48, group III, a carrier, aged 42, was admitted with nephritis and an old right sided hemiplegia from which he had partially recovered. There was no disease in respect to the lungs and abdomen. The heart showed evidence of mitral incompetence and hypertrophy. The apex beat was in the 5th interspace, external to the nipple line and five inches from the mid sternal line. The arteries were sclerosed and the systolic blood pressure was 178 mm. of Hg, the diastolic/

diastolic pressure was 120 mm. of Hg. The Wassermann reaction on the blood serum was negative. There was no enlargement of spleen. The liver was enlarged and extended two inches below the costal margin. There was oedema of the face and of the lower extremities. The urine contained albumin, pus and red blood cells but no casts. The urea concentration equalled 0.75 per cent and the diastatic value was 2. The prognosis was considered bad. The patient became gradually worse and died on 24.8.24. No post-mortem examination was granted.

Case No. 55, group I, a railway engine cleaner aged 25, was admitted to hospital complaining of pain in his back and of dyspnoea. He stated that he had been troubled with this condition since having had an attack of nephritis in 1919. He attributed this attack to chill. There was no evidence of disease in respect of lungs, abdomen and central nervous system. Beyond accentuation of the heart sounds there was no evidence of any abnormality regarding the heart. The arteries were not thickened and the systolic blood pressure was 145 mm. of Hg., the diastolic pressure being 90 mm. of Hg. The Wassermann reaction of the blood serum was strongly positive. There was slight oedema of the face and ankles. The urine contained a moderate amount of albumin, some hyaline and some granular casts but no red blood cells. The urea concentration equalled

0.75/

0.75 per cent and diastatic value was 2. In this patient there was always considerable diuresis after the XV grams of urea but this was not regarded as sufficient to account for the persistently low urea concentration percentage and diastatic value. The condition was one of chronic interstitial nephritis and the prognosis was considered to be grave. The patient was discharged home.

Cases Nos. 19, 23, and 45 of group II, and Case No.27, group III presented no special symptoms of interest beyond those of ordinary chronic interstitial nephritis. Each case returned a low urea concentration percentage together with a low diastatic value. The clinical findings were in keeping with these. The prognosis in each was considered to be bad. All these patients were discharged home.

Case No. 17, group III, an electrical engineer aged 49, admitted to hospital as chronic interstitial nephritis. Upon admission this patient suffered from considerable dyspnoea and oedema of the lower extremities. Oedema of the face was also present and there was a "perpetual tear" upon the conjunctiva. Examination of the heart showed aortic incompetence and cardiac hypertrophy, the apex beat being situated in the sixth interpsace in the nipple line four and a half/

half inches from the mid-sternal line. The arteries were markedly sclerosed and the systolic blood pressure was 170 mm. of Hg. and the diastolic pressure 90 mm. of Hg. The Wassermann reaction on the blood serum was strongly positive. The urine was loaded with albumin and contained pus and red blood cells but no casts. The urea concentration equalled 0.8 per cent and the diastatic value was 3.3. Repeated tests never returned any readings higher than the above.
The condition was considered to be one of chronic interstitial nephritis aggravated by the cardiac condition and the luetic infection present. The prognosis was considered to be grave. The patient was transferred to another institution.

Cases No. 2 and No. 42 of group III, both showed clinical evidence of chronic interstitial nephritis with cardiac hypertrophy and arterio-sclerosis. In both cases the systolic blood pressure was over 220 mm. of Hg. The urine of both contained a moderate amount of albumin and many red blood cells. On account of diuresis in both patients after the taking of XV grams of urea the test was repeated. The urea concentration and diastatic value in every instance remained low. The diagnosis was considered to be one of chronic interstitial nephritis and the prognosis grave. Both were allowed to return to their respective homes.

Case No. 51, group III, a trained nurse, aged 47, was admitted to hospital diagnosed as a case of nephritis. There was no evidence of disease in respect of heart, lungs and central nervous system. The spleen and liver were not enlarged but there was some tenderness in the region of the right kidney. The left kidney had been removed for tuberculous disease some years previously. The urine contained pus cells and a moderate amount of albumin but no casts or red blood cells. The urea concentration equalled 0.85 and the diastatic value was 3.3. The condition was regarded as tuberculous disease of the kidney with much impairment of function. The patient was allowed to go home; the prognosis was considered to be grave.

Case No. 14, group IV, a general labourer aged 64, was admitted to hospital for observation regarding the condition of albuminuria. Examination showed mitral stenosis and incompetence with cardiac hypertrophy. The apex beat was situated in the 6th interspace half an inch external to the nipple line and four and three quarters inches from the mid sternal line. The arteries were thickened and the systolic blood pressure was 142 mm. of Hg. with a diastolic pressure of 58 mm. of Hg. The Wassermann reaction on the blood serum was positive. The urine contains nothing to note. The urea concentration equalled 0.5 per cent and the diastatic/

diastatic value was 3.3.

In this patient there was marked diuresis after the taking of XV grams of urea, the diuresis amounting to 432 cc. of urine when both first and second hour specimens were taken into account. The marked diuresis present was, no doubt, largely responsible for the low percentage recorded, and the test in this instance could not be regarded as being of any value whatsoever. The condition was regarded as one of cardiac disease aggravated by luetic infection.

Case No. 16, group IV, a ported aged 51, was admitted suffering from an acute exacerbation of chronic interstitial nephritis. He stated that his first attack of nephritis had taken place twelve years previously, but that he considered the present attack to have been caused by dysentery contracted in the Dardanelles during 1915. When admitted there was no disease in respect of the lungs, abdomen or central nervous system. The Wassermann reaction on the blood serum was negative. There was slight cardiac hypertrophy, the apex being situated in the fifth interspace in the nipple line. The arteries were sclerosed. The systolic blood pressure was 210 mm. of Hg. and the diastolic pressure 120 mm. of Hg. There was oedema of the lower extremities and the conjunctiva showed a "perpetual tear". The urine was loaded with albumin/

albumin and contained many red blood cells and hyalo-granular casts. The urea concentration equalled 0.7 per cent and the diastatic value was 3.3. Since the XV grams of urea was followed by marked diuresis the value of the urea concentration was mitigated. But in view of the patients general condition and clinical findings the prognosis was considered to be grave. The oedema subsided and the patient was allowed home.

FUNCTIONAL ALBUMINURIA.

In twenty-five patients the albuminuria was regarded as functional. Of these 9.6% were in group one, 18.9% in group two, 10.7% in group three and 6.2% in group four. Perhaps it might have been reasonably expected to find the highest percentage in the youngest age group rather than in the second one. It was found however that the higher percentage occurred in the two younger groups.

Cases regarded as functional were those cases having albuminuria with no haematuria, no casts in the urine, no cardio-vascular changes and satisfactory renal efficiency as evidenced by the urea concentration and diastatic tests. Cases illustrative of this condition are Numbers 4, 19, 47, 59 and 60 of group I; numbers 4, 6, 24, 26, 27, 33, 39, 48, 56, 62 and 66 of group II; numbers 29, 34, 40, 52, 54, 55, and 56 of group III; and number 5 of group IV.

CHANGES IN DIAGNOSIS.

In the remaining cases under consideration a change of diagnosis was considered necessary after examinations had been carried out. Reference to the following cases, in all of which a change of diagnosis was made, will show that tuberculous disease, of the lungs/

lungs or kidneys, was the most prevalent of all. This condition was found to be present in thirteen patients, in two of which the disease affected the kidney whilst in the remainder it was of the pulmonary type. From five of the latter the tubercle bacillus was recovered. In the remainder the diagnosis was based upon the result of clinical examination strengthened by radiographic appearances. A table of the tuberculous cases is given here.-

CASES REGARDED AS BEING DUE TO TUBERCULOUS DISEASE.

No. & Group of Case	Service.	Casts.	Red Blood Cells.	Specific Gravity.	Albumin.	Oedema.	Blood Pressure.	Arteries.	Wassermann Reaction.	Heart.	Urea Concentration Test.	cc. of urine passed in second hour.	Diathatic test.	Remarks.
Case 17 Group I.	4 yr	Hy Gr.	-	1014	++	-	130/95	-	N	A.B. 5th Space. Int. N.L.	1.08	100	3.3	Tubercle bacilli recovered from sputum.
Case 32 Group I.	4 yr	-	-	1022	+	-	130/80	-	N	A.B, 5th Space. Int. N.L.	3.65	75	10	Tubercle bacilli recovered from sputum.
Case 33. Group I.	2 yr	-	-	1026	+	-	132/84	-	N	A.B. 5th Space. Int. N.L.	2.29	80	6.6	Extensive fibrosis of both lungs. Pulmonary tuberculosis (Non-active).
Case 46. Group I.	3 yr	-	-	1020	-	-	130/75	-	N	A.B. 5th Space. Int. N.L.	2.05	80	6.6	Tubercle bacilli recovered from sputum.
Case 12. Group II.	2 yr	-	+	1016	+	-	120/8	-	N	A.B. 5th Space. Int. N.L.	2.5	75	6.6	Extensive fibrosis both lungs. Pulmonary tuberculosis (non-active).
Case 34. Group II.	2 yr	-	-	1016	+	-	140/86	-	N	A.B. 5th Space. Int. N.L.	2.5	100	6.6	Tubercle bacilli recovered from sputum.
Case 36 Group II.	13 yr	-	-	1016	+ Pus	-	120/76	+	N	A.B. 5th Space. Int. N.L.	2.2	94	3.3	Extensive fibrosis both lungs. Pulmonary tuberculosis (non-active).
Case 40 Group II.	2 yr	-	-	1014	+ Pus	-	120/90	-	N	A.B. 5th Space. Ext. N.L.	2.1	84	6.6	Extensive fibrosis of both lungs. Pulmonary tuberculosis (non-active).
Case 51. Group II.	2 yr	-	-	1012	-	-	110/60	-	N	A.B. 5th Space. $3\frac{1}{2}$" M.S.L.	2.8	100	2	Tubercle bacilli recovered from sputum.
Case 8. Group III	3 yr	-	-	1028	++ Pus	-	128/90	+	N	A.B. 5th Space. Int. N.L.	2.65	66	10	Tuberculous kidney. Diagnosis confirmed by operation.
Case 43 Group III	20 yr	-	-	1024	+ Pus	-	120/80	-	N	A.B. 5th Space Int. N.L.	2·8	60	10	Extensive fibrosis both lungs. Pulmonary tuberculosis (non-active).
Case 47. Group III	2 yr	-	-	1018	-	-	135/90	-	N	A.B. 5th Space. Int. N.L.	1.75	146	66	Extensive fibrosis both lungs. Pulmonary tuberculosis (non-active).
Case 51. Group III	5 yr	-	-	1008	++ Pus	-	135/87	-	N	A.B. 5th Space. Int. N.L.	0.85	94	3.3	Renal tuberculosis bacilli recovered from urine.

In seven instances the prevailing disability was regarded as being cardiac in origin. Three of these patients also suffered from nephritis whilst in another the albuminuria was considered to be due to arterio-sclerosis.

Cases illustrative of this condition are given here; the first being No. 13, group I. This patient, a porter aged 23 years, was first admitted to hospital in August 1922 suffering from an attack of acute nephritis. He was at this time drawing a war pension for valvular disease of the heart, which condition was stated to be a sequela of rheumatic fever contracted nine years previously. On admittance this patient had ascites and oedema of the lower extremities. Crepitations were audible at the bases of both lungs. There was mitral incompetence and the second sound in the aortic area was accentuated. The apex beat was situated in the fifth interspace in the nipple line. The systolic blood pressure was 160 mm. of Hg. and the diastolic pressure 100 mm. of Hg. The Wassermann reaction on the blood serum was positive. The urine was loaded with albumin, contained red blood cells and casts of the hyaline and granular varieties. The urea concentration was 1.0% and the diastatic value was 10. In November 1922 the patient had recovered sufficiently to be allowed home.

In/

In May 1923 he was readmitted to hospital. Upon this occasion there was no ascites and no oedema. The lungs were now quite clear. The mitral incompetence was more pronounced and an aortic incompetence was also now in evidence. The systolic blood pressure read 120 mm. of Hg. and the diastolic 70 mm. of Hg. The urine was loaded with albumin and contained epithelial and hyaline casts but no red blood cells. The diastatic value was now 3.3 whilst the urea concentration percent was 2. He was again allowed home.

In October of 1924 he was again admitted. Upon this occasion with symptoms of a cerebral embolism and resultant paralysis of the right side. The mitral and aortic lesions were now well marked. He developed bronchopneumonia and succumbed after being in hospital for ten days. At the autopsy, which was granted in respect to the chest and abdomen only, the following conditions were found.

Both lungs were congested, the pericardial sac, distended with fluid, was found to contain a hypertrophied heart weighing 17 ozs. The mitral valve had vegetations on all curtains, in some instances extending on to the chordae tendinae. The aortic valve also had some vegatations upon it. The pulmonary and tricuspid valves were healthy. The liver, which was enlarged, smooth and of good colour, weighed 76 ozs. The spleen, also enlarged, weighed 19 ozs. The kidneys appeared/

appeared to be normal.

It would appear that this patient had to a large extent recovered from the nephritis of 1912 and that the cause of death was due to ulcerative endocarditis and sequelae thereto.

Case 27, group I, a rubber worker aged 27, was admitted to hospital in June 1922 complaining of dyspnoea, oedema of lower limbs and frequency of micturition. He was a well nourished man, somewhat cyanosed, and had oedema of legs. His lungs were healthy. His heart was hypertrophied with the apex beat ½ inch external to the nipple line in the fifth interspace. Auscultation revealed a mitral and an aortic incompetence. His systolic blood pressure was 110 mm. of Hg. and the diastolic 70 mm. of Hg. The Wassermann reaction on the blood serum was negative. His urine was loaded with albumin and contained red blood cells and hyaline casts. The diastatic value was 3.3 and the urea concentration equalled 1.45 per cent. The condition was considered as one of sub-acute endocarditis associated with nephritis. The patient improved and was discharged home after being ten weeks in hospital.

Case 22, group III, an ex regular soldier with thirty years service, aged 49, was admitted with nephritis and valvular disease of the heart. Examination/

Examination showed the patient to be cyanosed, to have oedema of the lower limbs and some ascites. The heart was hypertrophied, the apex beat being situated in the sixth interspace $5\frac{3}{4}$" from the mid-sternal line. There was a slight degree of arterio-sclerosis and the systolic blood pressure was 182 mm. of Hg. whilst the diastolic was 122 mm. of Hg. The Wassermann reaction of the blood serum was negative. The urine contained a trace of albumin but no evidence of any casts or red blood cells. The urea concentration equalled 1.6 per cent and the diastatic value was 3. There was present a mild degree of renal involvement in this patient, probably secondary to the cardiac condition. The patient retrogressed and died from cardiac failure. No autopsy was granted.

Case No. 33, group III, a shop keeper aged 44, was admitted complaining of dyspnoea. Upon examination the lungs and abdomen showed no sign of disease. There was however dilatation of the heart, the apex beat being in the sixth interspace in the nipple line. Mitral and aortic incompetence were also present. The systolic blood pressure was 150 mm. of Hg. and the diastolic pressure 60 mm. of Hg. The Wassermann reaction of the blood serum was negative. The urine contained a moderate amount of albumin, red blood cells occasionally but no evidence of any casts. The urea concentration equalled 1.4 per cent and the diastatic value/

value was 2. In this patient the renal impairment present was considered to be secondary to the cardiac disease. The patient was discharged home, but eighteen months later was readmitted with a superadded pneumonia and died before further tests could be carried out. No autopsy was granted.

Case No. 49, group III, a carter aged 45, was admitted for observation regarding the presence of nephritis. Beyond a slight trace of albumin there was nothing to note in the urine. The urea concentration was 2.85 per cent and the diastatic value was 10. The lungs showed evidences of an old standing bronchitis but the abdomen and central nervous system were healthy. The heart showed mitral incompetence with early signs of cardiac failure. The apex beat was in the fifth interspace, 4 inches from the midsternal line. The systolic blood pressure was 110 mm. of Hg. and the diastolic pressure 90 mm. of Hg. The Wassermann reaction on the blood serum was negative. The disability in this patient was considered to be cardiac, the renal organs appeared to be functioning well.

Case No. 3, group IV, a mason aged 59, was admitted complaining of dyspnoea. Beyond a persistent trace of albumin there was nothing to note in the urine. The diastatic value was 6.6 and the urea con-

centration/

concentration equalled 1.7 per cent. The cardiac condition was one of mitral incompetence and auricular fibrillation. The arteries were markedly sclerosed and the systolic blood pressure was 162 mm. of Hg. whilst the diastolic pressure was 110 mm. of Hg. The Wassermann reaction of the blood serum was negative. The albuminuria in this case was regarded as being a sequela of the cardiac and arterio-sclerotic conditions present and not due to nephritis.

Case No. 51, group I, a ploughman aged 25, was admitted to hospital for investigation regarding the condition of albuminuria which was present. Hyaline casts were also found on many occasions. The urea concentration equalled 2.65 per cent, after the test had been repeated on account of diuresis. The diastatic value was 6.6. The heart was slightly hypertrophied and both mitral and aortic incompetence were present. The Wassermann reaction of the blood serum was strongly positive. The systolic blood pressure was 140 mm. of Hg. and the diastolic pressure 90 mm. of Hg. There was no evidence of any arterio-sclerosis. The patient stated that he had suffered from an attack of rheumatic fever in 1918. The kidney function of this patient was considered satisfactory - the disability being regarded as cardiac.

Case 42./

TABLE OF CASES WITH MARKED CARDIAC SYMPTOMS.

No. & Group of Case.	Service.	Casts.	Red Blood Cells.	Specific Gravity.	Albumin.	Oedema.	Blood Pressure.	Arteries.	Wassermann Reaction.	Heart.	Urea Concentration Test.	cc. of urine passed in second hour.	Diastatic test.	Remarks.
Case 13 Group I.	2 yr	Hy. gr.	++	1010	+++	++	160/100	-	P	A.B. 5th Space N.L.	1.4	106	3.3	A case of nephritis and of ulcerative Endocarditis. Died.
Case 29. Group I.	7 yr	-	-	1022	-	+	137/90	+	N	A.B. 5th Space. Int. N.L.	2.5	110	3	Renal efficiency good.
Case 51. Group I.	6/12 yr	Hy. gr.	-	1028	+	-	140/80	-	P	A.B. 6th Space. N.L.	2.65	55	6.6	History of Rheumatic Fever obtained.
Case 22. Group III	30 yr	-	-	1008	+	++	182/122	+	N	A.B. 6th Space. 1" Ext. N.L.	1.6	100	3	Died in hospital.
Case 33. Group III	2 yr	-	+	1012	+	-	156/60	+	N	A.B. 6th Space. N.L.	1.4	100	2	Died in hospital.
Case 49. Group III	18 yr	-	-	1022	+	+++	110/90	-	N	A.B. 5th Space. Int. N.L.	2.85	62	10	Chronic Bronchitis. and Mitral Incompetence.
Case 3. Group IV	20 yr	-	-	1014	+	-	162/110	+++	N	A.B. 5th Space. N.L.	1.7	90	6.6	Arterio sclerosis.

Case 42, group I, a clerk aged 29, was admitted to hospital for observation regarding albuminuria. He was a poorly nourished man , but had no clinical evidence of disease in respect of his heart, lungs, abdomen or central nervous system. The urine was free from albumin, casts and red blood cells. The diastatic value was 10 and the urea concentration equalled 3.10%. The Wassermann reaction on the blood serum was negative. The patient presented no evidence of nephritis, but the urine contained 1.8% of sugar, and as the patient had other symptoms of diabetes the diagnosis was changed accordingly.

In four patients, namely No. 39 and No.57 of group I, No. 49 of group II, and No. 25 of group III a diagnosis of renal calculus was made. These four patients had albuminuria and pyuria, and the urea concentration was regarded as being satisfactory in all four. Each of these patients complained of pain in the kidney region. In case No. 57 the diagnosis was confirmed by radiograph, whilst in the other three the diagnosis was confirmed by subsequent operation.

Case No. 10, group II, a farmer aged 32 years, was admitted for observation regarding the condition of albuminuria. Examination revealed a poorly nourished, languid, man with pigmented areas over certain parts of the body and upon the mucous membrane inside/

inside the mouth. The lungs and abdomen were clinically healthy. The Wassermann reaction upon the blood serum negative. The heart healthy but sounds very faint. The systolic blood pressure was 100 mm. of Hg. whilst the diastolic pressure was 54 mm. of Hg. Beyond an intermittent trace of albumin in the urine there was no evidence of any urino-genital disturbance. The urea concentration equalled 2.46 per cent and the diastatic value was 10. The patient himself complained of feeling tired and having attacks of vomiting. The condition was regarded as one of Addison's disease and not nephritis.

Case 58, group II, a commercial travelled aged 32, presented particular interest in so far as that on 12.1.24 he was admitted to hospital for treatment of tonsillitis, and whilst under treatment for this condition an acute attack of nephritis intervened. The heart, lungs, abdomen and central nervous system showed no signs of disease. The systolic blood pressure was 140 mm. of Hg. but later fell to 125 mm. of Hg. The diastolic pressure read at 85 mm. of Hg. and later fell to 75 mm. of Hg. When admitted the urine was healthy but after being three days in hospital the urine contained hyaline casts, red blood cells and a moderate amount of albumin. The diastatic value was 6.6 and the urea concentration equalled 1.1%. The patient improved and was discharged in March 1924.

Upon/

Upon 2.10.24 this patient was readmitted to hospital for treatment in respect of his original invaliding disability of neurasthenia and the opportunity thus afforded of re-examining him regarding the condition of nephritis was taken. The urine was found to contain a trace of albumin and occasional red blood cells but no evidence of any casts. The urea concentration had improved in so far as that the percentage upon this occasion was 2.7. On the contrary the diastatic value had fallen to 3.3. The Wassermann reaction on the blood serum was negative. There was thus evidence of a chronic nephritis of mild degree.

Case 20, group III, a mill hand aged 50, was admitted to hospital on 28.11.21 complaining of tiredness, dizziness and general weakness. He stated that these symptoms had only come on following a bicycle accident in February 1921. This accident necessitated the removal of the right kidney. His general condition was poor and the patient appeared to be dull and drowsy. The cardio-vascular system appeared to be healthy and the Wassermann reaction on his blood serum was negative. The systolic blood pressure was 115 mm. of Hg. and the diastolic pressure 70 mm. of Hg. There was no oedema. Beyond a persistent trace of albumin there was nothing to note in the urine. The diastatic value was 6.6 and the urea concentration equalled 1.68 per cent. The abdomen showed the scar of the/

the operation referred to above. The patient had occasional attacks of sickness and gradually retrogressed until he died on 5.4.22. The condition was regarded as one of uraemia following the operation of nephrectomy.

At the post-mortem examination no evidence of disease was discovered in respect of the heart and lungs. The liver and spleen were normal. The remaining kidney contained a large encapsulated cyst involving approximately one third of the secretory tissue. In addition to the kidney lesion present the brain was found to contain an adenoma, which had originated in the choroid plexus and involves the brain tissue.

Case 2, group II, a mill worked aged 36, admitted to hospital for treatment of nephritis. Upon examination the patient was found to be sluggish in his actions and responses. His main complaint was that of headache. There was no evident disease in respect of heart, lungs, or abdomen. The arteries were sclerosed and the Wassermann reaction upon the blood serum was strongly positive. The urine was healthy, the diastatic value was 10 and the urea concentration equalled 2.07 per cent. The patient presented no evidence of nephritis. The central nervous system showed fair co-ordination, the presence of knee and ankle jerks upon both sides. The plantar response

on the left side gave the Babinski sign. Both optic discs showed evidence of neuritis. The patient died and post-mortem examination revealed no disease in respect of the heart and lungs. The liver was normal, the spleen slightly enlarged. Beyond slight congestion there is nothing to note in the kidneys. In the brain the left cerebral hemisphere was found to be almost entirely replaced by a large cyst containing a yellow fluid.

Case No. 41, group I, a farm hand, aged 24, was stated to have had albuminuria previous to his admittance to hospital. Upon examination no evidence of disease could be elicited in respect of the heart, lungs, central nervous system or abdomen. The Wassermann reaction on the blood serum was negative. The systolic blood pressure was 140 mm. of Hg. and the diastolic pressure 90 mm. of Hg.

Repeated examinations of the urine, whilst in hospital, failed to reveal any evidence of albumin, red blood cells or casts. The diastatic value was 6.6 and the urea concentration in an average taken from four tests was 1.2 per cent. This low percentage is partially explained by the repeated diuresis which always followed the taking of XV grams of urea by this patient. This is not considered to be the whole cause of the low percentage shown. Clinical examination failed to reveal any sign of disease and he was discharged from hospital after being under observation for six weeks.

Case No 8, group III, a farmer aged 42, was admitted for treatment for chronic nephritis. Examination showed no evidence of disease in respect of the lungs, heart or central nervous system. The arteries were palpable and the systolic blood was 128 mm. of Hg. whilst the diastolic reading was 90 mm. of Hg. The Wassermann reaction on the blood serum was negative. The urine contained many pus cells and some albumin but no casts or red blood cells. The diastatic value was 10 and the urea concentration equalled 2.65 per cent. The patient complained of a dull pain in the left loin, of frequency of micturition and stated that he had suffered from haematuria previously. This latter condition was not verified by hospital observation. The condition was regarded as one of tuberculous disease of the left kidney. Cystocopic examination showed no evidence of cystitis and the renal efficiency being considered satisfactory, operation for the above condition was performed. Operation confirmed the diagnosis and the patient made an uneventful recovery.

Case 60, group II, a nurse aged 37, was admitted complaining of intense pain in the left lumbar region. She had undergone the operation of nephrectomy for the right kidney on account of tuberculous disease in February 1921. Examination shewed no evidence of disease/

disease in respect to heart, lungs and central nervous system. The abdomen showed the operation scar otherwise there was no abnormality to note. The urine contained pus cells and a slight trace of albumin, but no casts or evidence of red blood cells. The diastatic value was 6.6 and the urea concentration equalled 3.4 per cent. The Wassermann reaction of the blood serum was negative. The systolic blood pressure was 130 mm. of Hg. and the diastolic 79 mm. of Hg. The patient did not present any evidence of renal insufficiency, the albumin and pus were considered to be a sign of chronic cystitis. The patient had been in the habit of taking large quantities of morphia to alleviate the pain of which she complained, and the diagnosis made in this instance was that of morphomania.

Case No. 21, group III, a school janitor aged 44, was admitted with a diagnosis of chronic interstitial nephritis. He complained of dyspnoea and had marked oedema of his face and ankles. Examination revealed no evidence of disease in respect to lungs, heart, abdomen and central nervous system. The systolic blood pressure was 126 mm. of Hg. and the diastolic pressure 80 mm. of Hg. The Wassermann reaction of the blood serum was negative. The urine contained albumin and many pus cells but no casts or red blood cells. The diastatic value was 6.6 and the urea concentration /

concentration equalled 2.35 per cent. Further examination revealed an almost impermeable stricture of the urethra, and the patient admitted having had an attack of gonorrhoea seventeen years previously. The renal efficiency was considered to be good and it was thought that the general health would improve if the cause of the backward pressure was removed. The patient was accordingly transferred to surgical wards where operative treatment was carried out. Unfortunately septicaemia supervened and the patient died. No autopsy was granted.

Case No. 35, group II, a seaman aged 40, was admitted for observation regarding the presence of nephritis. There was no evidence of disease in respect of heart, lungs, abdomen, or central nervous system. The Wassermann reaction on the blood serum was negative. The systolic blood pressure was 140 mm. of Hg. and the diastolic 96 mm. of Hg. The urine contained pus cells, albumin and an occasional red blood cell. The diastatic value was 3.3 and the urea concentration equalled 1.9 per cent. Further examination revealed a stricture of the urethra. The patient then admitted having had gonorrhoea some years previously. The renal condition was regarded as being due to backward pressure caused by the urethral stricture.

Case No. 31, group I, a fireman aged 26, was admitted to hospital with a diagnosis of nephritis. Examination failed to reveal any evidence of disease in respect of heart, lungs, abdomen or central nervous system. Beyond a persistent trace of albumin in the urine there was nothing to note. The urea concentration equalled 2.5 per cent and the diastatic value was 3.3. There was no evidence of stricture but after prostatic massage gonococci were recovered from the urethra. Therefore the diagnosis was changed from that of nephritis to gonorrhoea, and the patient treated accordingly with satisfactory results.

Case No. 2, group III, a slater aged 50, was admitted to hospital for observation regarding nephritis. His only complaint was that of headache. Examination revealed no enlargement of the heart but some accentuation of the second sound in the aortic area. The arteries were markedly sclerosed and the systolic blood pressure was 208 mm. of Hg. whilst the diastolic pressure was 112 mm. of Hg. The Wassermann reaction of the blood serum was strongly positive.
The urine contained a trace of albumin in each specimen examined but there was no evidence of any casts or red blood cells. The diastatic value was 6.6 and the urea concentration equalled 3.45 per cent. The albuminuria in this patient was considered to be a manifestation of the arterio-sclerosis present and not due to nephritis.

Case No. 15, group IV, a saw-mill worker aged 51, was admitted to hospital stated to be suffering from the effects of nephritis contracted whilst in France during the year 1916.

The general condition of this patient was satisfactory, and his only complaint was of headache. There was no cardiac enlargement but accentuation of the second sound in the aortic area. The arteries were markedly thickened and the systolic blood pressure was 160 mm. of Hg. and the diastolic pressure 90 mm. of Hg. The Wassermann reaction of the blood serum was strongly positive. The urine contained no evidence of albumin, casts or red blood cells. There was no polyuria. The diastatic value was 2 and the urea concentration equalled 2.5 per cent. There was no evidence of nephritis and the condition was considered to be one of arterio-sclerosis.

Case No. 5, group II, a miner aged 38, was admitted with a history of having suffered from nephritis since 1915. The lungs, cardio-vascular system, and abdomen revealed no evidence of disease upon clinical examination. The urine contained pus cells and an occasional trace of albumin. There was no polyuria. The diastatic value was 10 and the urea concentration equalled 2.6 per cent. The Wassermann reaction on the blood serum was strongly positive and the patient developed/

developed symptoms of secondary syphilis whilst in hospital. The diagnosis was changed accordingly.

Case No. 4, group IV, a labourer aged 58, was admitted to hospital for treatment of nephritis. Upon examination this patient was found to be suffering from chronic bronchitis and emphysema. His heart was enlarged the apex beat being in the fifth interspace just external to the nipple line. The cardiac sounds were closed in all areas but there was accentuation of the second sound in the aortic area. The arteries were very much sclerosed. The systolic blood pressure was 230 mm. of Hg. and the diastolic pressure was 130 mm. of Hg. The Wassermann reaction of the blood serum was negative. The urine contained pus cells and a moderate amount of albumin but no casts or red blood cells. The diastatic value was 3 and the urea concentration equalled 2.5 per cent. The albuminuria in this patient appeared to be a sequela of the chronic bronchitis, arterio-sclerosis and cardiac hypertrophy present.

---

6. SUMMARY.

1. Two hundred cases of nephritis have been investigated. All these cases were admitted to Craigleith Hospital as definite cases of nephritis.

2. Modern tests for renal efficiency have been compared. For reasons stated on pages 27 - 30 the urea concentration test of Maclean and De Wesselow was found to be the most reliable and best suited for use by a general practitioner.

3. Cases of albuminuria with no haematuria, no casts in the urine, no cardiovascular changes and satisfactory renal efficiency as evidenced by the urea concentration of the urine and the diastatic test were regarded as functional.

4. Of the 200 cases 25 were found to be functional according to these criteria; 81 were found to be due to actual nephritis; in 35 the albuminuria was apparently a sequela of or concomitant with cardiovascular disease; in 13 the albuminuria appeared to depend on tuberculosis of the kidney or lung; in 23 the albuminuria seemed to be dependent on a number of diverse conditions; in 23 there was no evidence of albuminuria.

5./

5. The incidence of the conditions varied according to the age group of the patients.

   (a) In the second group (31-40) there was a higher proportion of functional cases. It was lowest in the fourth group.

   (b) In the second group (31-40) there was a higher proportion of actual nephritis.

   (c) In the fourth and oldest group there was the highest incidence of cardiovascular cases.

   (d) In the third group (41-50) there was the highest incidence of patients in which no albuminuria or other evidence of disease was obtained.

6. An analysis of the 81 cases of actual nephritis has been made with a view of enquiring into their etiology.

   (a) A positive Wassermann reaction was obtained in 7.4% of the 81 actual nephritis cases, whilst it was obtained in 10% of the total number of cases. Thus the percentage in the nephritis cases was less than the percentage of all the cases.

   (b) It is remarkable that 44% of all cases examined and 57% of the actual nephritic cases attribute their nephritis to exposure but it is open to question whether this opinion may not be biased by the patients views as to entitlement/

entitlement to pension. As all these patients were ex-service men there can be no doubt that the exposure to which they were subjected was severe and often prolonged.

(c) There is no evidence to support the view that age, previous occupation, or length of service with the colours were of etiological significance.

(d) There is no satisfactory evidence that hyperchlorination of the drinking water or any of the possible factors discussed on pp. 55 - 70 had anything to do with nephritis.

(e) The curious heavy incidence among troops in the trenches as compared with those in base depôts, and in troops who came into contact with men from the line suggests that an unknown causal agent may have been carried by lice.

7. Should a patient recover from an acute attack of nephritis one of three things may happen. Firstly, he may recover completely, in which case no further signs or symptoms of renal disease will be elicited; or, secondly, the recovery may be almost complete and yet the patient may remain subject to frequent relapses of sub-acute nephritis; or, thirdly, the condition may become chronic and progress in a slow insidious manner. In all probability the second/

second and third possibilities will go on until a granular kidney results.

8. Since surgical operations in connection with these cases so frequently give bad results, the patient often dying of uraemia, it is necessary to know the renal efficiency before operative treatment is undertaken. Now, the renal efficiency can be quickly and approximately gauged by the urea concentration test. Two patients were operated upon for renal calculus, one for tuberculous kidney and one for urethral stricture. All these patients gave a satisfactory renal efficiency and all came through the operation successfully except the last named who died from septicaemia.

---

7. REFERENCES.

1. Maclean, H. Albuminuria and War Nephritis among British troops in France. page 13.

2. Maclean, H. Albuminuria and War Nephritis among British troops in France. page 50.

3. Chandler, F.G. Practitioner. July 1921. page 38.

4. Maclean, H. Albuminuria and War Nephritis among British troops in France. page 25.

5. Price, F.W. A Text-book of the practice of Medicine. Section XV. page 1132.

6. Van Slyke. Journal Biological Chemistry. 1914. 19. page 211.

7. Maclean, H. Modern Methods in the diagnosis and Treatment of Renal disease. 4. page 44.

8. Maclean, H. Modern Methods in the diagnosis and treatment of Renal disease. 4. page 41.

9. Maclean, H. Modern Methods in the diagnosis and treatment of Renal disease.

10. Comrie, J.D. Lancet II. 1921. page 1150.

11. Comrie, J.D. Lancet II. 1921. page 1150.

12. Auld, A.S. British Medical Journal. Sept 29th, 1917.

13. Comrie, J.D. Lancet II. 1921. page 1150.

14. Harrison and Lawrence. Lancet I. 1921. page 170.

15. Comrie, J.D. Lancet II. 1921. page 1150.

16. Maclean, H. Modern Methods in the diagnosis and treatment of Renal disease. 5. page 54.

17. Maclean, H. Modern Methods in the diagnosis and treatment of Renal disease. 5. page 57.

18. Chase and Myers. Journal of American Medical Association. 1916. No.13. page 929.

19. Maclean, H. Modern Methods in the diagnosis and treatment of Renal disease. 5. page 63.

20. Addison and Watamabe. Archives of Internal Medicine. 1917. page 507.

21. Lewis and Mosenthal. Journal of Americal Medical Association. 1916. page 933.

22. Vallery-Radot. Etudes sur le fonction rénal dans les néphrites chroniques. Paris. 1918.

23. Maclean, H. Modern Methods in the diagnosis and treatment of Renal disease. I. page 13.

24. Macleod and Ameuille. Lancet 1916. 2. pages 468, 483 & 551.

25. Maclean, H. Modern Methods in the diagnosis and treatment of Renal disease. 3. page 37.

26. Abercrombie, R.J. "Acute Renal disease amongst troops in France". British Medical Journal Oct. 9th. 1915.

27. Raw, N. British Medical Journal Sept 25th. 1915.

28. Brown, Langdon. Report of Meeting of the Medical Society of London. British Medical Journal. Nov. 26th 1916.

29./

29. Brown, Langdon. War Nephritis - Pathology of diseases of the War. R. Muir. page 558.

30. Shaw Dunn and McNee. A contribution to the study of War Nephritis. British Medical Journal. Dec. 8th. 1917.

31. Bruns. War Nephritis. Pathology of diseases of the War. R. Muir. page 558.

32. Oliver, Sir I. "On War Nephritis and some circumstances incidental thereto. British Medical Journal, Dec. 8th, 1917, page 735.

33. Muir, R. War Nephritis. Pathology of diseases of the War. page 561.

34. Clarke, R.C. British Medical Journal. April 22nd 1916.

35. Coombes, C.F. Lancet 1918. I. page 495.

36. Bradford, J.R. Quarterly Journal of Medicine 1915-1916. 9. page 125.

37. Wilson, A.J. (Bradford, Bashford, Wilson). British Medical Journal Feb. 1st, 1919.

38. Brown, Langdon. War Nephritis. Pathology of diseases of the War. R. Muir. page 560.

39. Mackenzie Wallis. Report on Meeting of the Medical Society of London. British Medical Journal. Nov. 25th 1916.

40. Ameuille. War Nephritis. Pathology of diseases of the War. R. Muir. page 560.

41. Report of Committee on War Nephritis. No.3. I. July 7th, 1918.

42. Chapple, W.A. British Medical Journal, June 23rd 1917.

43. Bull, S.A. British Medical Journal. Oct. 6th, 1917. page 454.

44. Macleod and Ameuille. Lancet 1916. pages 468, 483, 551.

45. Medical Research Committee. June 7th 1918.

46. Dyke, S.C. Lancet. Sept. 7th 1918.

47. Chandler, F.G. Lancet 1916. 2. page 537.

48. Muir, R. War Nephritis. Pathology of diseases of the War.

49. Maclean, H. Albuminuria and War Nephritis among British Troops in France, I. page 53.

50. Abercrombie, R.J. Leading Article. British Medical Journal. Feb. 11th 1916. Meeting of Sections of Pharmacology and Therapeutics of the Royal Society of Medicine.

51. Brown, Langdon. British Medical Journal Nov. 25th 1916. Report on Meeting of the Medical Society of London.

52. Dunn, J.S. British Medical Journal, Nov. 25th 1916. Report on Meeting of the Medical Society of London.
